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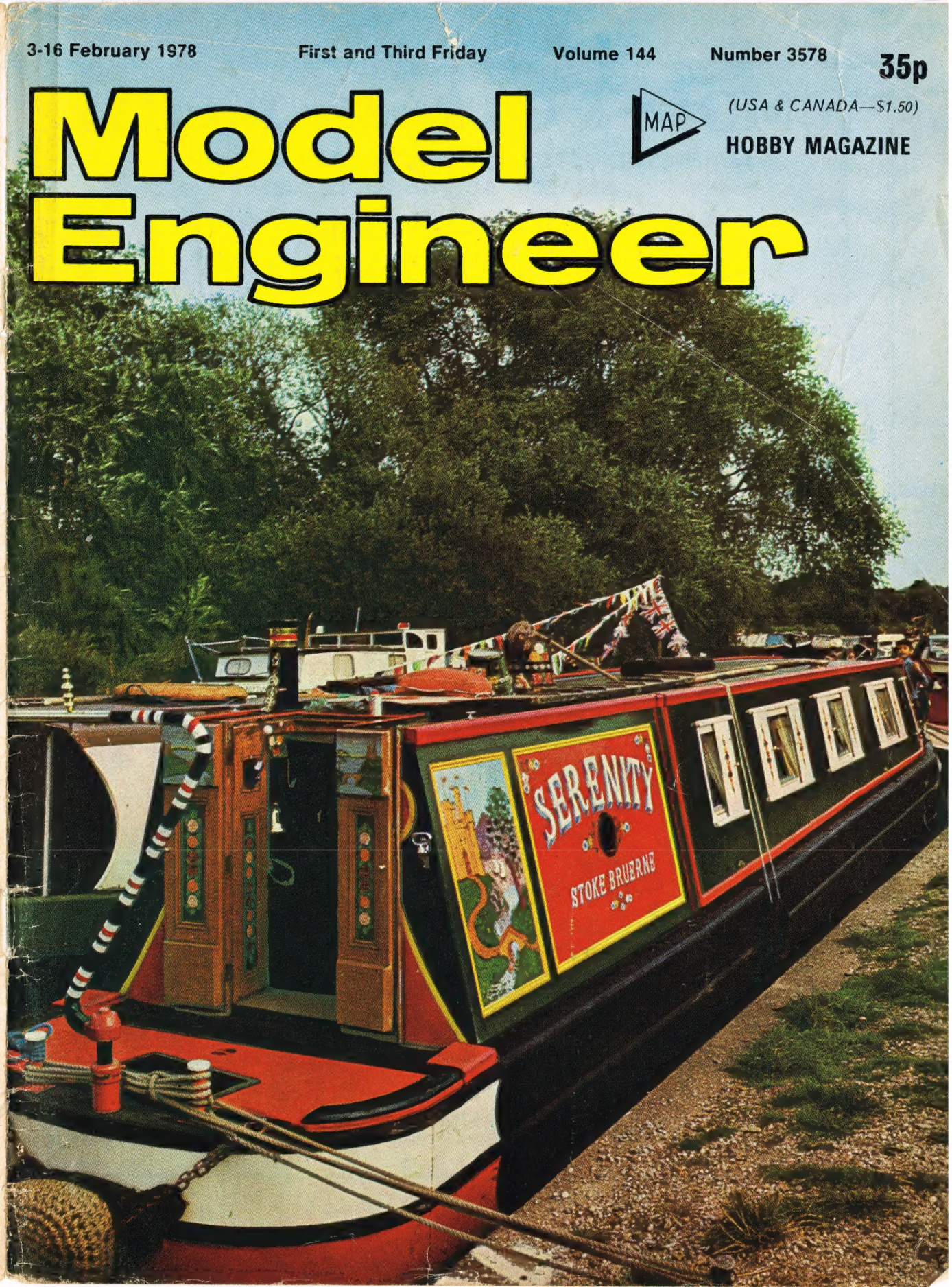

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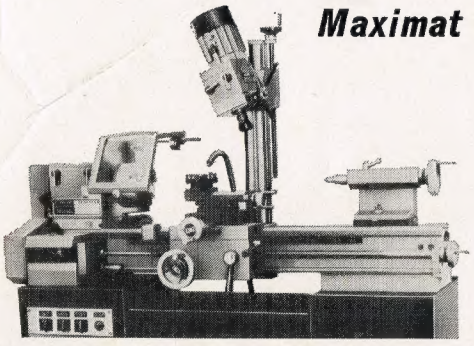

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Volume 144 Number 3578

3 February 1978

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"Serenity", owned by Mr. Milne Postlethwaite.
Photographed by Paul Barrett at the Boxmoor Jubilee Rally of Boats last September.

NEXT ISSUE

Start of a Bulldog/Dukedog loco series.

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The Editor is pleased to consider contributions for publication in "Model Engineer". Manuscripts should be accompanied if possible by illustrations and should also have a stamped addressed envelope for their return if unsuitable. While every care is taken, no responsibility can be accepted for unsolicited manuscripts, photographs, art work, etc.

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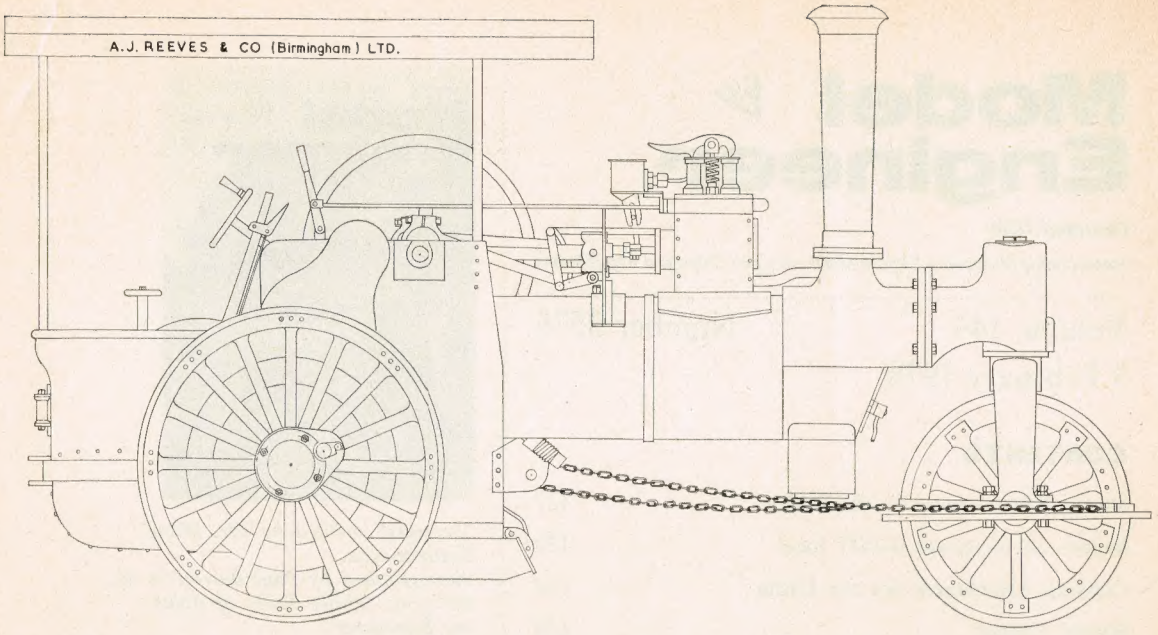
M.E. QUERY COUPON FEBRUARY 1978



INTRODUCING THE "MINNIE" CONVERTIBLE

Convertible engines were used extensively by contracting firms and were hired out for agricultural, road haulage or road rolling use. The engines were built as a basic agricultural tractor but fitted with a specially adapted smokebox and saddle to enable easy conversion as required. This convertible version has been prepared by David Piddington using the 1″ scale "Minnie" design by L. C. Mason. The only alteration being the smokebox, to which the new components are fitted.

ROLLER CONVERSION

Drawing. R.V.47		75p	Front fork	1 GM	£4.54	Saddle	1 GM	£2.72
Front rolls	2 AL	£6.00	Steerage quadrants	2 GM	98p	Disc flywheel	1 CI	£1.41
Front hub centres	2 GM	£1.52	Lower fork bush	1 GM	68p	Rear spokes only		95p
Front hub in & out's	4 GM	£1.74	Fork head	1 GM	£3.25			

The following components, including drawings, listed for the "Minnie" Traction are required for the "Convertible" with the exception of the items marked with an asterisk.

"MINNIE" 1″ Scale traction engine by L. C. Mason

Drawings. T.E.1 (9 sheets)		£7.64	Motion plate saddle	1 GM	44p	Steering worm & wheel		£3.30
Flywheel	1 CI	*£1.69	Feed pump body	1 GM	99p	Spur gears. Set of 8		£12.00
Brake drum	1 CI	£1.30	Rear wheel hubs	2 GM	£2.12	Spokes & strakes, punched		£2.25
Winding drum	1 CI	£1.30	Rear wheel inside covers	2 GM	£1.39	Horn & spectacle plate matl		45p
Rear wheel rims	2 AL	£3.36	Rear wheel caps	2 GM	58p	Smokebox door	1 GM	*53p
Front wheel rims	2 AL	*£1.50	Construction manual		£3.95	Steering wheel	1 NS	46p
Chimney	1 AL	75p	Shaft bearings	1 GM	£1.85	Driving centre L.H.	1 CI	30p
Cylinder block and covers	3 GM	£4.24	Chimney saddle	1 GM	*93p	Driving centre R.H.	1 CI	30p
Cylinder liner	1 GM	46p	Steering chain		50p	Eccentric straps. V.G.	2 GM	37p
Valve chest	1 GM	66p	Wire rope		75p	Eccentric strap. Pump.	1 GM	23p
Regulator chest	1 GM	53p	Smokebox ring	1 GM	*73p			

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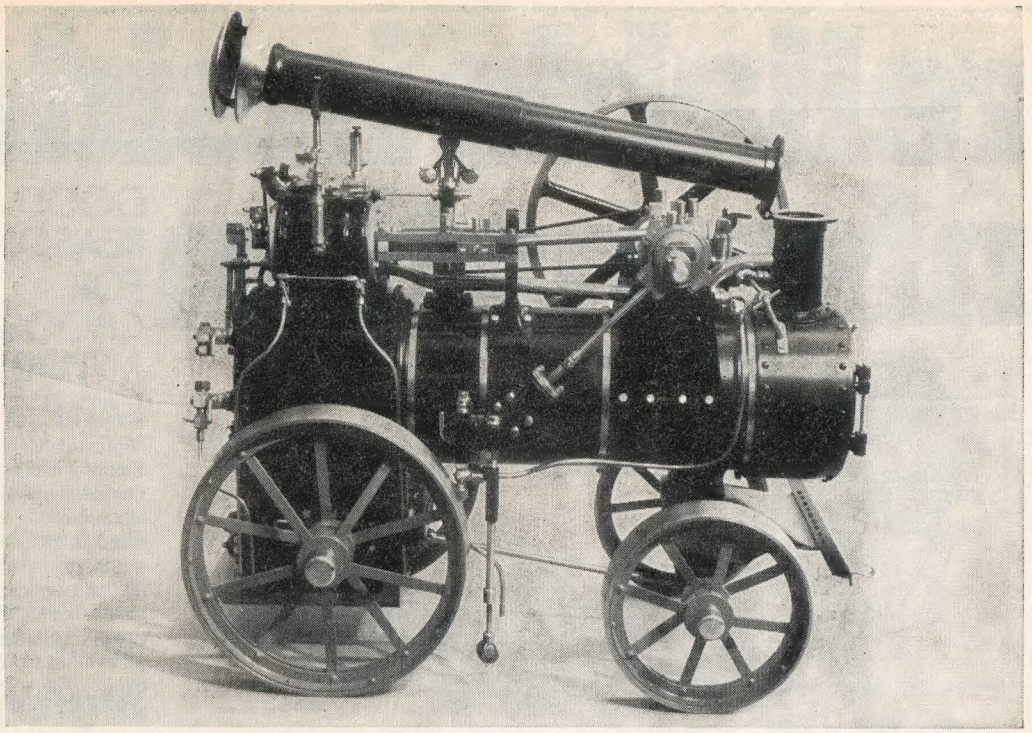

The "MARSHALL" portable engine by W. J. Hughes in 1½" Scale

This is the latest list of castings supplied exclusively by A. J. Reeves & Co. (Birmingham) Ltd by special arrangement with Mrs W. J. Hughes. The completion of the design is now assured by the good offices of a group of Model Engineers who are collaborating on the production of the remaining drawings.

Drawings. H.S.20	each 60p	Guide bar support. Cyl end	21p	Chimney cap	71p
Cylinder block	£6.93	Stop valve bracket	17p	Chimney hinges	76p
Cylinder liner	£1.52	Crankshaft carriage, pump side	61p	Chimney base	£1.51
Valve chest	£2.58	Crankshaft carriage, flywheel side	68p	Perch bracket	83p
Slide valve	22p	Regulator control bracket	25p	Under gear casting	£1.36
Slide valve buckle	14p	Carriage brasses, pump side	61p	Fore carriage plate	£2.20
Cylinder end covers	48p	Carriage brasses, flywheel side	45p	Pump & valvebox	£1.52
Glands etc	51p	Caps for carriages	38p	Pump machining jig	61p
Valve chest cover	23p	Water pump pad	68p	Eccentric strap for pump	—
Valve rod gland body	33p	Eccentric strap, valve gear	30p	Eccentric sheave for pump	25p
Stop valve	14p	Flywheel	£2.16		
Stop valve cover	68p	Chimney baffle plate	47p		

"NICHOLAS" A 1/16" scale Organ Engine. Model designed by Ronald H. Clark from the original engine made by Savages Ltd. Organ engines were used to drive the mechanical organ on fairground gallopers and musical rides. Finished model is 6" high, 3" x 3¾" base, 2½" dia. flywheel, 9/16" bore x 7/8" stoke. Not recommended for beginners!
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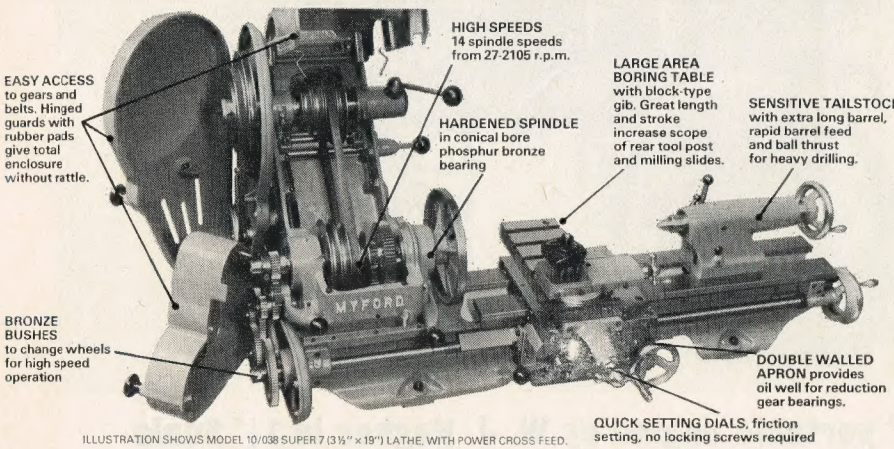
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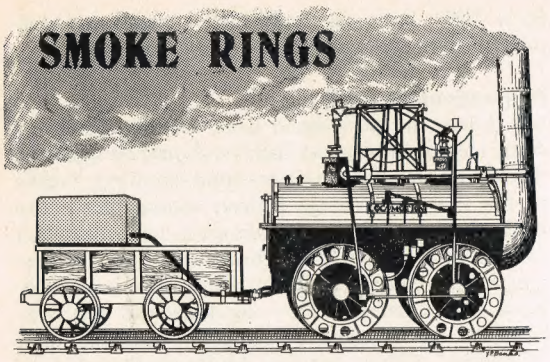


"Flying Scotsman" in Barrow

Alan Haworth has written to tell us that the *Flying Scotsman* arrived at the Vickers yard on 12 December last year and is at present undergoing a boiler change and other maintenance operations. The ex-L.N.E.R. Pacific arrived under her own steam from Steamtown, Carnforth, but had to be lifted by a 250-ton crane onto Vickers' boiler shop rails. The firm has handled steam locos before but, apparently, not for over 50 years although there is not expected to be any difficulty performing this relatively basic task. The work scheduled should take a few weeks and hopefully we can come up with a photograph or two and a progress report.

"Invicta"

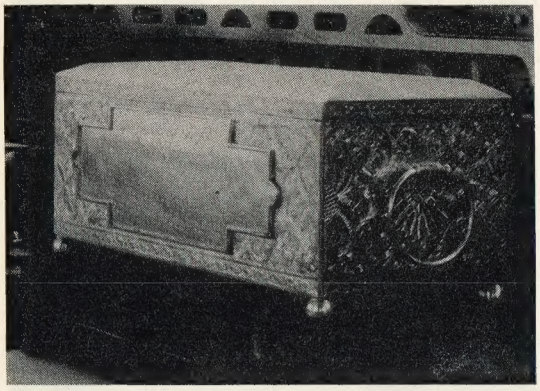
We have now received the official press release from the City of Canterbury Museums explaining the movements of *Invicta.* There is no need to elaborate as the information was carried in "Smoke Rings" in the 18 November issue last year. There are, however, some interesting historical notes which explain that *Invicta* was the 24th loco built by the Robert Stephenson works in Newcastle and went into service in 1830. She was the first loco with outside cylinders at the leading end and worked at 40 p.s.i. Some time in her life the separate firebox was taken off and the twin-flue boiler replaced by a single flue with a square smoke-box at the front. This boiler was longer than the original and the wheelbase was therefore lengthened to 5 ft. £10,000 is required to put the old lady back into display condition and the Transport Trust has launched a "Save *Invicta*" appeal—although this appears to be more local to North Kent than nationwide. However, if any individual or club are prepared to make some

Earl Mountbatten of Burma and three of his grandsons take a close look at the traction engine presented to him at the M.E. Exhibition. On the right is a model of the torpedo hoist invented by the Earl in the 1930s.

offering to help the fund along, it will undoubtedly be very appreciated. The Transport Trust is at 18 Ramillies Place, London W1V 2BA.

Help wanted please

Readers of long standing may recall that in 1935 Mr. R. S. E. Hill won The Sarawak Trophy shown here for the best working model at the Model Engineer Exhibition. His loco was a 2½ in gauge "Dyak". The trophy, along with several other items of silver, was stolen some time before 15 December from the home of Mrs. Hill and we have been asked by Mr. A. R. Hill, the son of R.S.E., to publicise this so that any reader having seen the trophy recently may contact him. The Sarawak Trophy measures 11 x 5 x 4¾ in., has a loop handle at each end, and is engraved all over except for the bottom and edges. It is lined with near black hardwood. A suitable engraving on the front plaque describes the award and states that it was presented by George R. Stevenson. The casket was made by natives of Brunei, Borneo. Fortunately the winning loco and others were not taken.



New catalogues

Precision Paints Company Ltd. has just brought out its 1978 catalogue and price list and has increased the contents by several new colours and the S10, S11 and S12 Kaowool boiler insulating materials which will be welcomed by those not wishing to use asbestos. The company regrets that it has to now charge 15p for the catalogue and that postal customers should include a large (at least 9 in. x 4 in.) s.a.e. The address is Precision Paints Co. Ltd., P.O. Box 43, Cheltenham, Glos. GL51 5HR. A. J. Reeves of Marston Green, Birmingham, also has a new catalogue in circulation and this is also a must for serious loco builders and those with slightly different interests. As usual all the locos, T.E.s and stationary engines are featured and the lists of materials, tools and equipment are as long as ever. A useful addition is the flanged boiler plate formers which Reeves now sell. Superscale Ltd., of Bentalls, Baildon, Essex SS14 3DD, have also published a new catalogue of materials and tools. Price is 30p with s.a.e.

Publications in hand

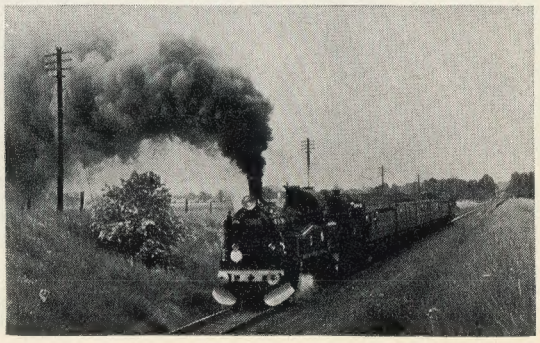
Ian Allan, the publishers, have recently given us some idea of the books which we should be seeing in the shops soon and the titles sound tempting. *Trains to the West* by George Heiron should please the G.W. fans and *Great Locomotives* is a collection of the established favourites. *Collett & Hawksworth Locomotives* by Brian Haresnape is another book in the series of loco engineers and will concentrate on "Castles", "Kings", "Schools" and "Counties". Others are *East Midlands Branch Line Album, Highland Railway Album No. 2, Still in Steam* (New Edition), *Roaming the Scottish Rails* and *Last steam locomotives of Spain and Portugal.* All should be available in the spring or summer.

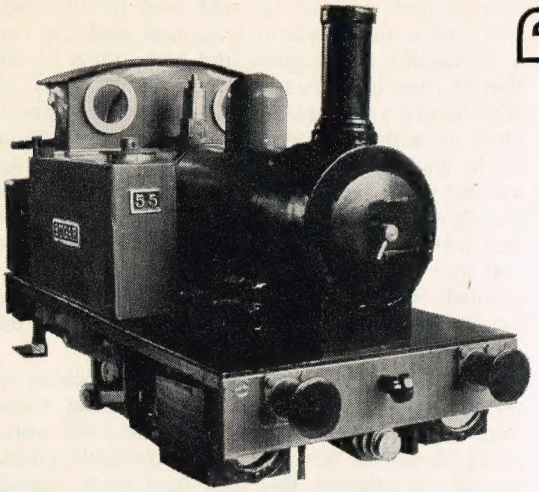
Ted Jeynes replies

We have been asked by Ted Jeynes, whose popular "Corner" has brought us comments from all over the world, to express his thanks to all those readers who have sent him Seasonal Greetings. At the time he wrote to us Mr. Jeynes had received 230 messages of goodwill and to reply to each would be a tall order. So, a big thank you from Ted Jeynes and also from *M.E.'s* office to those readers who kindly sent us similar greetings.

A.R.P.S. Award

The annual award made by the Association of Railway Preservation Societies Ltd. has been won, for 1977, by Peterborough Railway Society Ltd., for the most outstanding contribution to railway preservation. The Society has justly deserved this award for its successful efforts in reopening the Nene Valley Railway from Wansford to Orton Mere which closed in 1972. The award was made at Peterborough's A.G.M. on 28 January and is a coat-of-arms from a royal train of the London, Brighton & South Coast Railway. The photo shown here is of a Swedish SI 2-6-4T double-heading a Swedish S 2-6-2T past Castor on the Nene Valley Railway.





'SUGAR'

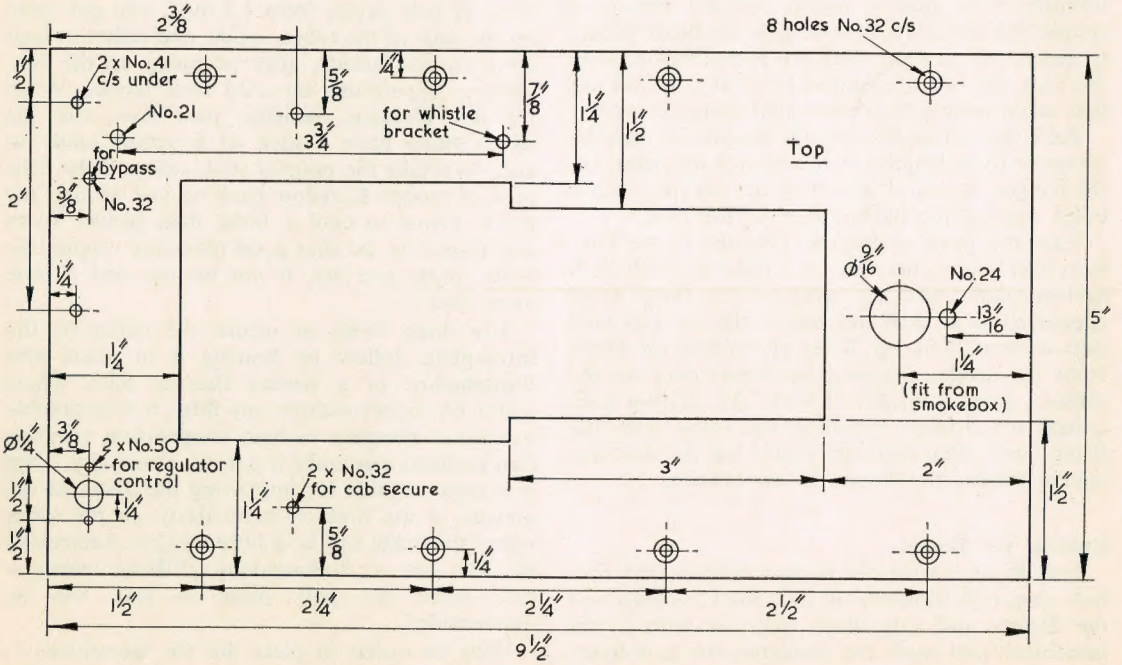
by Rex Tingey

Part IV

From page 74

BOILERMAKING IS ONLY as difficult as you think it is, and in this case it is as easy as "Sugar". The boiler is going to be covered with cleading, eventually, so there is no worry about runs of braze, nor about bumps and hollows, or twist or warps. Don't be mean with the molten metal, these days the copper costs nearly as much as the silver solder, so use as much as is necessary to make a good, tight, heavy job. With this small size of boiler there is little need for a special hearth, a sheet of ½ in. thick hard white asbestos is all that is required, and the heating can be carried out with a medium size blowtorch using butane gas; use a 10 lb. cylinder and make sure there is at least 5 lb. of gas in the cylinder before starting. Propane can of course be used, but a reducing valve is required.

Carefully mark out the parts, including the flanges, on the 16 gauge copper. The hardest part in making the boiler is the flanging of the copper, but it is only hard work, and the success of easy brazing lies in the accuracy of the flanging (and having plenty of heat). Cut out the pieces with large tin snips and leave them twisted, lay them on the asbestos to heat them, one at a time, to red



FOOTPLATE: 16 gauge mild steel

heat, then pick them up and dunk them; use an old pair of pliers. A plastic bucket just over half full is ideal for dunking, and it is a good idea to use the sulphuric acid pickle bath for the annealing as this cleans up the copper (pickle bath = 5% sulphuric acid + usual safety precautions). Cut off the length of 2 in. dia. seamless copper tube for the boiler shell, but do not anneal this.

For flanging, three formers about 3 in. long are required, one of $1\frac{3}{4}$ in. dia. dural for the smokebox tubeplate, one of $1\frac{7}{8}$ in. for the backhead, and a third of $1\frac{1}{2}$ in. for the firebox plates, all with a nice flat end. Use duralumin formers to give sharp edges without cutting the copper; the dural edges collapse rather than shear the copper if attacked with too much vigour, also the alloy formers do not allow the flanges to be hammered down too thin, and tend to leave the flanges a little thicker than the original gauge giving scope for filing and fitting without having to make allowance. The scribed circles for the flanges are for reference to be outside on the copper.

As all the flanges are turned over outside use the pein of the hammer (not the ball) and use two hammers, standard weight and pin, with a lot of controlled banging, turning the plates on the formers in the vice. If a buckle develops re-anneal the plate before banging it flat. Don't worry about pocks and hammer marks, or try hammering for a perfect fit; file the smokebox tubeplate for a near interference fit and just make the others nice and round. Internal flanging is avoided at the throatplate as this is rather difficult; instead a simple half-collar is fitted to give the braze plenty to grasp. All straight sides are hammered over in the vice and when required to meet a round are first taken over before the round flange is made.

Bend the wrappers around lengths of smaller diameter to fit lengths of the correct diameter, try the flanges, and if all fits, then cut out the various holes, leaving the backhead plain for now.

Turn the piece of firehole ringtube in the Unimat, both ends, and make it a tight fit. Drill both firebox plates and the wrapper for three small copper rivets at each end, one at the top and each side at about $\frac{3}{4}$ in. up. Rivet up holding the rivets from the inside, snapping the heads over on the outside, good and tight. If there are any big gaps anneal the firebox, avoiding the rivets with the flame, and, after dunking, gently tap the softened copper around the flanges before brazing.

Brazing the Boiler

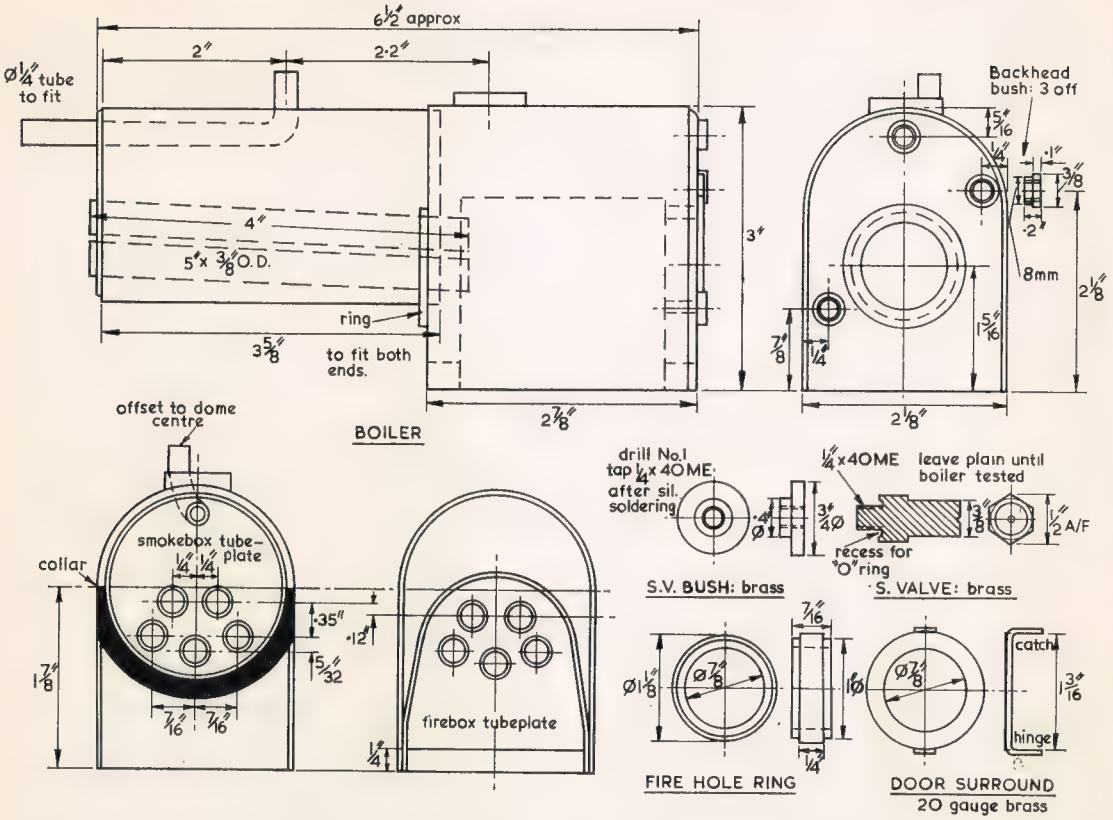
Use B6 or C4 for the firebox interior and firehole ring, with Tenacity 4B flux. First wash around the flanges and ring inside and out with a wet paintbrush and apply the powdered flux in dollops, wetting with the brush again to even it all round. Lay the box on one side and prop up the open end with a small piece of $\frac{1}{4}$ in. mild steel, cut two $\frac{1}{8}$ in. lengths of Easyflow and place them at the flanges, one either side; have a pointed stick of steel handy, and a pair of old combination pliers. Heat up with the point of the blue of the flame at the thickest part inside, that is the firehole ring, and the small assembly will soon glow red and the Easyflow will run along the flux line. Follow the line with a stick of C4, fluxed on the end, each side and around the ring, prick around with the pointed stick. Flip the box over with the stick and braze the other edges and this time outside the ring.

Wait until the glow dies away before picking up the box with the pliers and pickling. After a few minutes take the bucket over to the cold water tap, pick out the box and wash thoroughly, cleaning off the adhering flux with wire wool. Inspect outside edges to see that a good line of braze can be seen all round. Any poor areas can be dealt with later.

Cut the lengths of $\frac{3}{8}$ in. O.D. copper tube for the firetubes to be long at the smokebox and clean up the ends to go in the firebox and tap them gently in place, holding them at the other end with the smokebox tubeplate. The tubes can be touching, bent and crooked, but they must hold the correct pattern at the ends and protrude into the firespace about $\frac{1}{8}$ in. Wet the tubes at the firebox and apply Easyflow flux paste inside and out. Make five $\frac{3}{8}$ in. I.D. circles from Easyflow No. 2 wire, or half circles from 1.5 mm., and put them on the ends of the tubes, inside, and reflux to heat up from the outside, after propping up the box, opening uppermost, on mild steel blocks. When the flux blackens, reddens, then runs with the silver solder have a stick of Easyflow ready to add, then take the pointed stick and pull the little pool of molten Easyflow back up and around the tubes. Leave to cool a little, then pickle. Wash and inspect to see that good fillets are ringing the tubes inside and out, if not we can add a little more later.

Use three rivets to secure the collar to the throatplate, follow by brazing it in place with Phosphalloy, or a similar cheaper fillet, which works on copper without any flux: it is unsuitable for use in firespace as high temperature combustion products can make it porous, eventually. Thus it is quite suitable for improving the fillets on the outside of the firebox, particularly on the tubes where the braze can be a little meagre. Remember the first law of boilermaking: "When testing a new boiler the only place to leak will be inaccessible".

With the collar in place file the throatplate to a good fit on the boiler barrel, rubbing down the

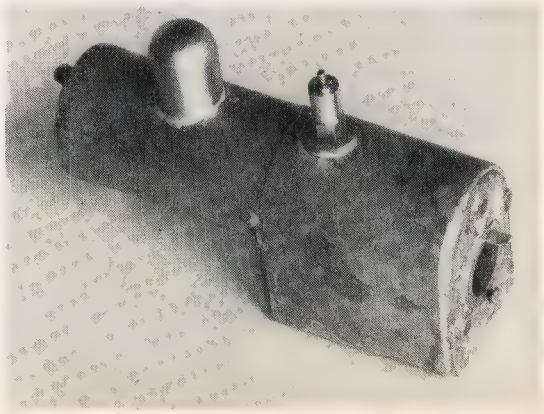


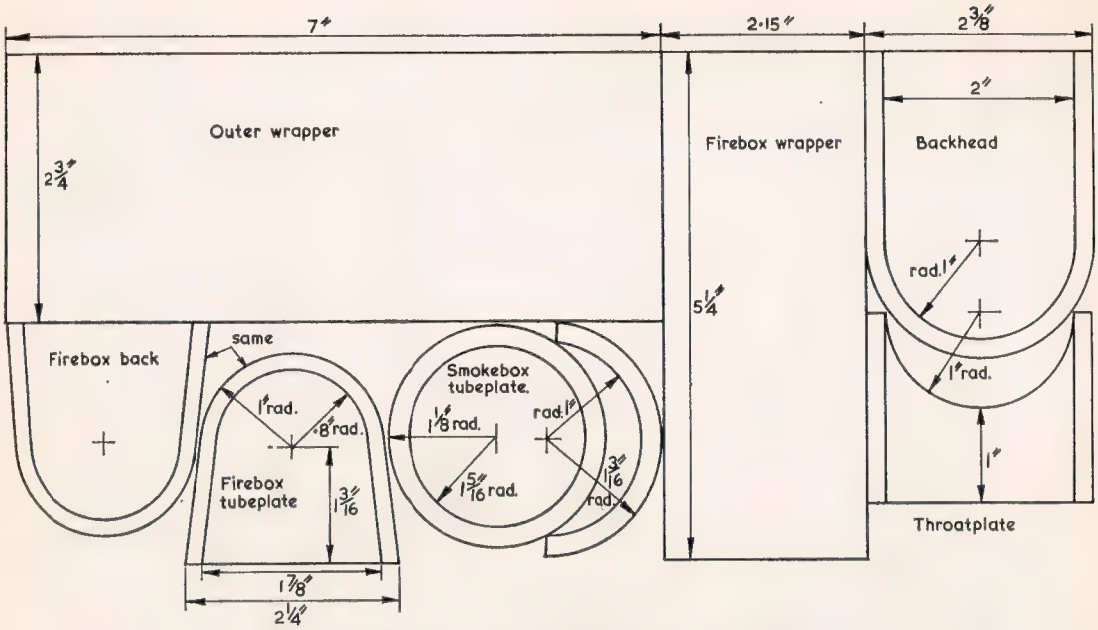
end of the unannealed tube with fine emery cloth so that it is clean. Rivet the wrapper onto the end of the shell with three rivets, one at the top and one at each side at about 60 degrees down. Rivet the throatplate to the wrapper, tight against the barrel, then lightly tap the edge of the wrapper all round to a snug fit. Braze with the Phosphalloy, the job on one side, turning it after completing one side; it is wise to support the front of the barrel with a piece of 16 gauge metal. It will be noticed that the collar fillet does not melt, even in contact with the fresh molten fillet which is forming, because the Phosphalloy after setting has a much higher melting temperature; this is useful when stage-brazing. Use the pickle bath, as the barrel needs to be annealed now, its backhead being good and strong and difficult to distort from round, and its front end needs to be soft for the tubeplate and the sulphuric pickle keeps the copper clean and pink.

Gently hammer and file the bottom sides of the box to be flat and fit against the inside of the outer wrapper, painting with Easyflow flux before fitting and riveting in place, approximately central, with two rivets per side. Lay the boiler on one side, front end propped up and the edge just raised off the asbestos. Lay a small piece of Easyflow No. 2 on the inside edge and heat, away from the piece of solder, until it runs, feeding in a stick of Easyflow until it appears on all edges, then running the pointed stick round. Turn the boiler over and treat the other side, adding a blob or two of flux first. Allow to cool a little before pickling. If pickled whilst hot all the flux will clean off in the pickle, without any help.

Cut a length of ¼ in. O.D. copper tube, to convey the steam from the dome to the smokebox,

Boiler complete with dome and safety valve.





BOILER ECONOMY CUTTING GUIDE: 16 gauge copper

bend and fit to leave a good length protruding at the smokebox end. Flux the tubes and fit the tubeplate, prop the boiler upright and make rings from 1.5 mm. Easyflow No. 2 for the tubes, including the one at the dome. Flux again and heat up at the barrel edge near the steam pipe. When the silver solder flows follow it round the flange, being generous with the Easyflow, and getting a good fillet around the tubes. Follow the flange around again with the pointed stick and prick around the tubes. Carefully turn the boiler onto its foundation and heat at the dome tube, dipping the Easyflow into the flux to assist the flow. Allow to cool a little before knocking the boiler onto its side to be picked up with the pliers at the foundation and lowered, aperture uppermost, into the pickle.

The backhead is fitted into its wrapper, held, and the outline of the firehole ring marked through from the firebox with the angled end of the scriber. Remove to draw a good circle of the outer dimension using the smaller, scribed circle as a guide, cut out with the Conecut and then file to a tight fit. Drill a hole for one, only, backhead bush, then hold the backhead in place and gently tap the wrapper all round to a good close fit, starting at the top for each side. Place the boiler nose forward and, starting at the top, braze in the backhead and ring using Phosphalloy all round.

Clean up the foundation of any protruding bits and tailor two blocks of copper from $\frac{1}{2}$ in. x $\frac{3}{8}$ in. strip to a tight hammer fit. Wedge one surface a little, liberally apply Easyflow flux and hammer the blocks home. Fill any small holes left by flanges with copper pieces of rivets, fluxing well before silver soldering the whole foundation ring, using plenty of heat at the inserted blocks, and taking the solder right round.

Turn the safety valve bush and the three backhead bushes from brass, Conecut the safety valve hole and clean up the one backhead hole. Wash the boiler out to flush away copper particles, flux around the two holes, inserting the bushes, and silver soldering in place. Pickle and wash before tapping the two bushes $\frac{1}{4}$ in. x 40 ME. Make the safety valve blank, with the "O" ring recess, as shown, using a white silicone ring, 7/32 in. I.D., tight above the threads.

Hydraulic Test

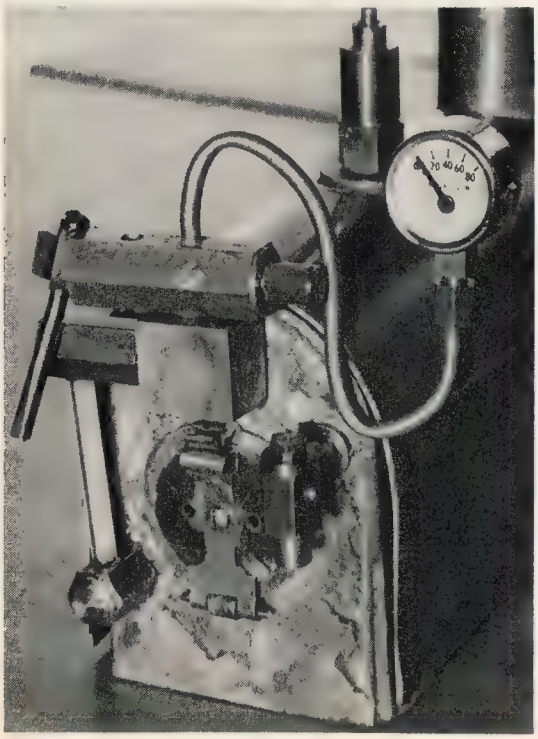
Couple up the hydraulic test pump to the backhead bush, with a suitable pressure gauge (2 in. or $2\frac{1}{2}$ in. at least), and fit the safety valve loosely, boiler level. Put the inlet of the pump into a dish of water and fill the boiler until water emerges from the safety valve bush. Tighten up the valve and give the whole lot a good shake to bring up all the air bubbles, release the safety valve to pump up again to overflow. Close the valve, which needs to be only finger tight at any time with this design, wipe off the boiler and surrounding surfaces before pumping up to pressure.

Take the pressure to 50 p.s.i. for a few minutes, and, if no jet of water bursts forth, increase the pressure to 100 p.s.i. Leave for about five minutes,

watching for any drops of water around the boiler or on the dry surfaces, then raise the pressure to 150 p.s.i. Keep the boiler at this pressure for 20 to 30 minutes.

When first raised to the 150 p.s.i. the flat sides of the outer wrapper will bulge very slightly, and the same will occur inside the firebox: the bulging is no cause for alarm and will not increase with time or with use, particularly as the boiler will be used at lower steam pressures in practice. If the bulges worry you then by all means fit a couple of stays each side. The bulges do not affect the fit of the boiler in any way, but it should be noted that the outer and firebox wrapper *must* be at least 16 gauge copper, and not thinner.

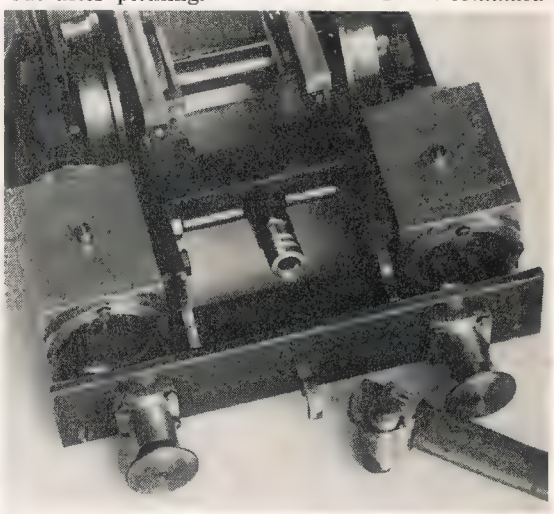
If your boiler has a nasty warp or twist built into it do not put it into the vice and try to straighten it out with crowbar and hammer; cleading, tanks and cab can cover a multitude of sins. So long as you fit the safety valve, dome and the chimney upright and in line it will all look right. If brazing instructions have been followed it is unlikely that any leaks will develop in the testing but if they should then they must be caulked. Cracks in the braze are best dealt with by opening slightly with a small sharp chisel edge, refluxing and silver soldering with Easyflow No. 2. Small holes should be drilled out and copper rivets inserted and silver soldered in place. Comsol solder can be used for caulking but not at this stage, where further silver soldering has to be carried out on the boiler, as the Comsol would run away.

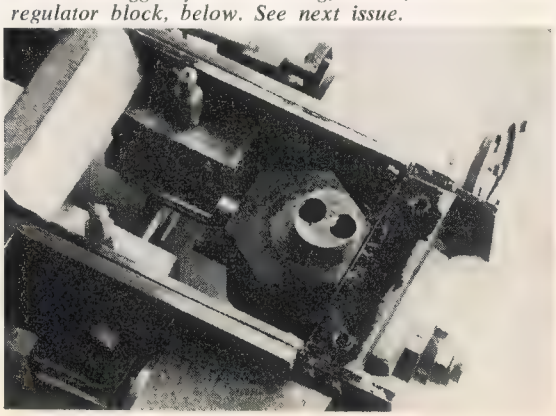


Boiler Fittings

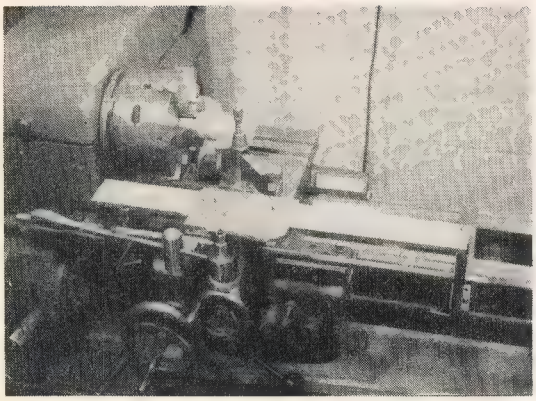
Make the dome from a piece of 1 in. dia. brass, flycutting the end to a saddle, held in the vertical slide, drilling through and then boring out the steam space. It is secured to the top of the boiler with a single support, threaded 6 BA each end, before being silver soldered in place, a tapered nut on top being also brazed in. First the three No. 12 holes are drilled to be within the circumference of the dome, for the steam.

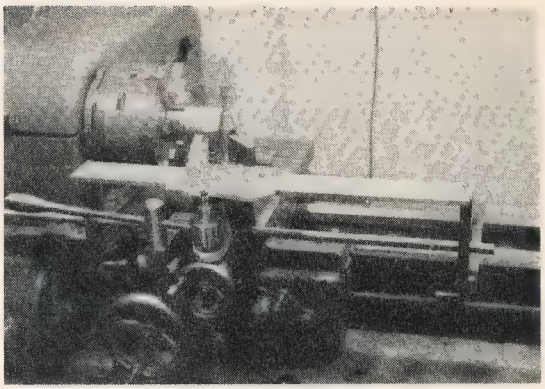
The safety valve can have its middle drilled and threaded for its ball, spring and spindle, secured with an annular nut. The backhead can be drilled for two more bushes, the door surround made, and the three silver soldered, followed by the dome, all well fluxed beforehand. The door surround, by the way, is best made with two or three prongs left in the centre and bent at 90 degrees, to hold it in the firehole ring for brazing, filing out after pickling. *To be continued*

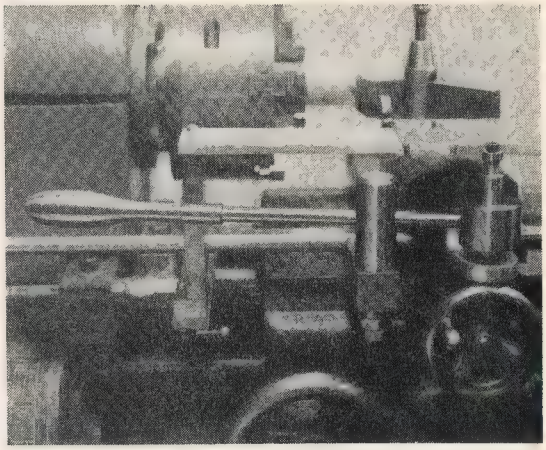




The loco rigged for air testing, above, and with regulator block, below. See next issue.







A COPYING ATTACHMENT FOR THE LATHE

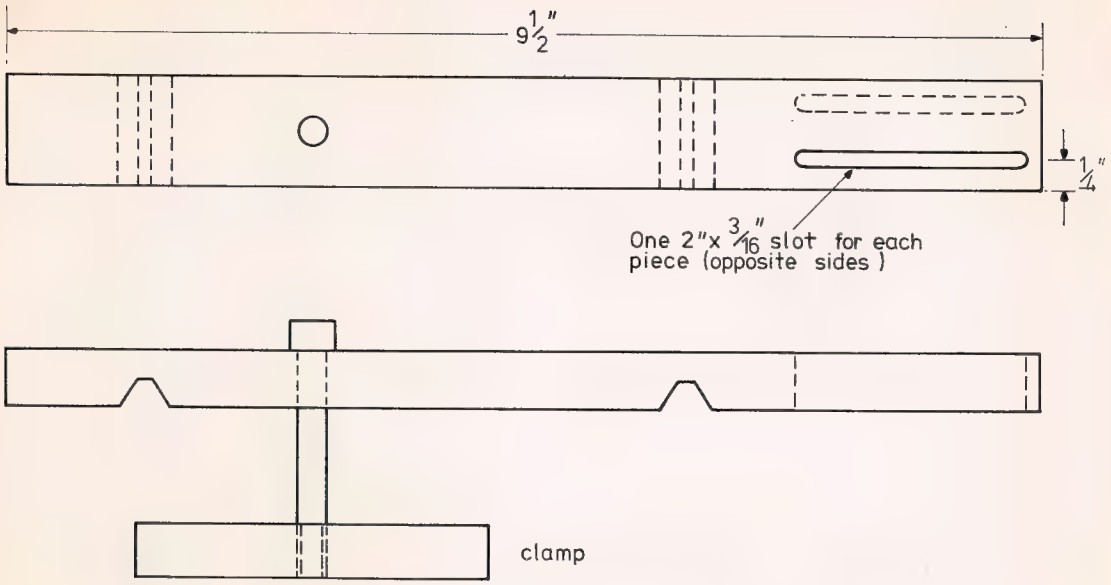
by Allan Mackintosh

ONE OF MY VICES is that I am a bookworm. The reprint firm of Dover in New York is well aware of this and I am a regular recipient of their flyers on new reprints; I am afraid that I succumb to their blandishments all too often.

At the beginning of this year they announced that they were reprinting two volumes from the five-volume series on shop matters written by John Jacob Holtzapffel at the end of last century. I ordered these and, in spite of the price ($15 each), they are very good value for the money; they are 9½ in. x 6½ in., the binding is excellent (hard cover), paper and type very good, they are profusely illustrated with first-rate woodcuts, and amount to 579 pages for the first volume and 644 pages for the second.

I did not get much new knowledge from the first book titled *Hand or Simple Turning* except for ways of dealing with recalcitrant grain in wood turning. The second book on *Complex Turning* has given me all kinds of new ideas and it is an eye-opener on the incredible things that can be done with the lathe. At the same time, one cannot help being rather amused at the love of ornamentation (and bad taste) exhibited by the Victorians; for instance, one can hardly think of a more functional item than a toilet roll holder—on page 159 of the second volume is illustrated a toilet holder which is profusely decorated and must have been a wonderful dirt-catcher, quite apart from the waste of expertise and energy that must have gone into making it.

During the last few years we have had several articles in *M.E.* from people who have been lucky enough to come into possession of Holtzapffel lathes; many of them have lost all or most of their attachments and, in some cases, it has appeared that the owners were not clear what attachments still remaining were to be used for. The second volume contains detailed descriptions of all the attachments for these lathes and how to construct them and is an extremely useful addition to the library of any lathe-owner, and a "must" for owners of Holtzapffel lathes. Incidentally, in the excellent introduction by Robert Austin, it is pointed out that the price of a Rose Engine lathe with complete attachments was about £1500 in 1838, sufficient to buy half a street of houses in those days and approximately equal to £130,000 in today's money; so perhaps we are not very



(1) End supporting bars, 2 reqd.

justified when we grumble at the prices we have to pay for a modern engine lathe.

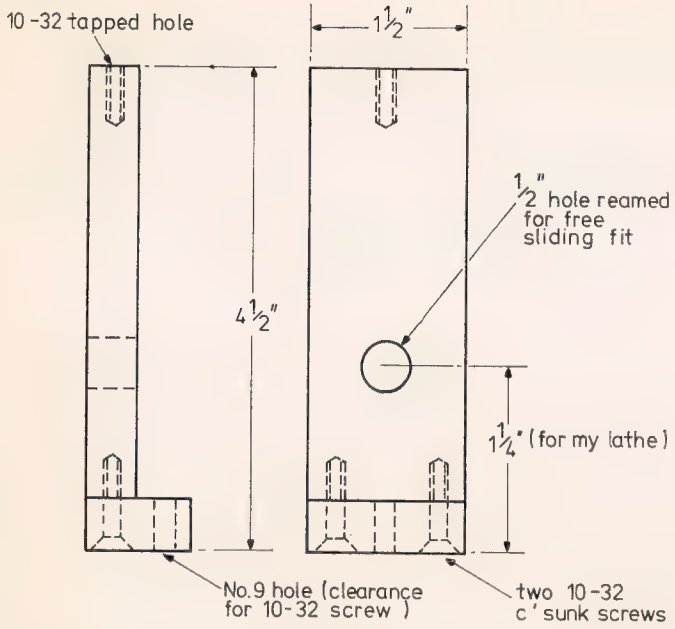
After having admired the various chalices and what J.J.H. calls "tazzas" in the illustrations, and which would be quite impossible to drink out of owing to the ornamentation around the rims, my grey matter began to turn over and I looked more closely at the attachments for the lathes. The first one that I decided that I could not live without is what he calls a "curvilinear attachment", but which I prefer to call a copying attachment—less of a tongue-twister! Anybody who has tried to turn up handles for any purpose knows what difficulties they present; they never turn up to what one has in mind, are frequently anything but aesthetic and, once one has turned one that is satisfactory, it is virtually impossible to turn a duplicate. The copying attachment works on a template and it is possible to modify the template until one has obtained a satisfactory profile and then to turn out as many duplicates as one requires.

The "curvilinear attachment" illustrated on page 96 of the second volume is a complicated structure and is designed for hand feeds only; power feeds were not thought of in those days, other than the treadle, and I saw that considerable modification would be necessary for a modern lathe. The first thing to do was to eliminate all the twiddley-bits and curlicues beloved of J.J.H. and to get the design down to basics; the second was to take advantage of the power feed of the lathe.

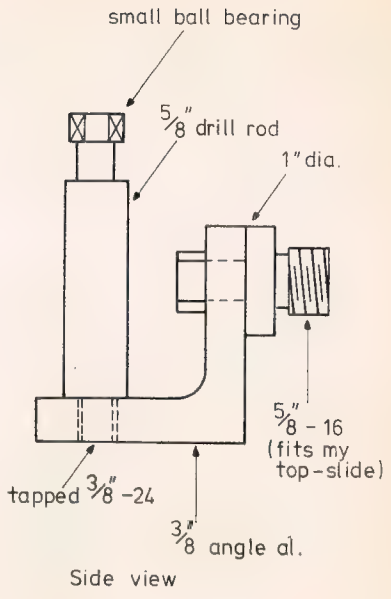
This latter consideration required a lot of thought and I am not at all sure that I have come up with the best solution (anybody who thinks of a better one, please write me). It was obvious that the top-slide, with the screw-feed removed and provided with a lever-feed instead, would have to be used for following the curves of the template, and this required that the top-slide would have to be set at right-angles to the latheways. The template, on the other hand, would have to be stationary with regard to the longitudinal feed but at the same time would have to be adjustable in small increments in order to take care of the depth of cut taken by the tool. The increments would have to be done with the cross-slide, but how to do this when the cross-slide was moving under the power-feed while the template had to be stationary longitudinally? After several false starts which did not give the necessary motions, the arrangement described below was come up with; as I say, I have a nagging thought at the back of my mind that this is not the best solution but, short of making up complicated auxiliary cross-slides with gibs etc., I cannot think of a better one at the present time.

My lathe is a 5½ in. Logan with the usual etceteras, its carriage is 11 in. long and I decided that 8 in. travel would be sufficient to accommodate the longest template that I was likely to use. The dimensions given are to satisfy these conditions and will want revision for other lathes and other dimensions.

Two pieces of 1 in. x ¼ in. cold rolled steel were cut to length and cleaned up to 9½ in. long. These



(2) End supporting brackets for template carrier 2 reqd.



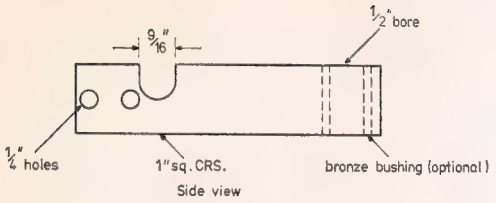
(3) Top slide bracket, height of ball-bearing should match that of template. 1 reqd.

were provided with V-notches to match the V-ways of the lathe, slots were cut in them 2 in. long x 3/16 in. wide as shown, and clamps were made from the same steel to fasten them to the latheways, using ¼ in.-20 Allen cap screws.

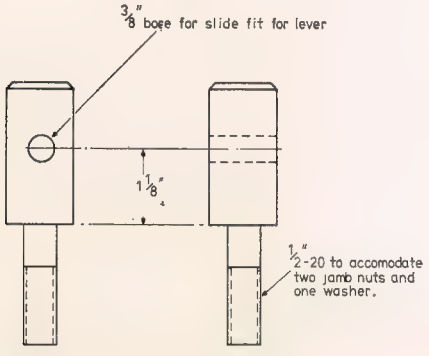
Heavy brackets were made to fit on these. They were built up from 1½ in. x ½ in. CRS and some more of the 1 in. x ½ in. and have an included height of 4½ in.—sufficient to clear the top-slide by about ½ in. They fasten to the 2 in. x 3/16 in. slots by means of 10-32 cap screws and as a number of surplus ball handles had been made when constructing Prof. Chaddock's tool and cutter grinder, these were used instead of ordinary nuts. The half-inch holes shown in the drawing were not bored at this time.

A stud was made to fit the top-slide and this carries a bracket made from some heavy ⅜ in. thick aluminium angle which was dredged from the scrap barrel. The other arm of the bracket is drilled and tapped for a stud made from ⅝ in. drill rod which in turn carries a small ball-bearing which should come at the height of and engage the template. Dimensions for these items should be worked out for your lathe; the drawing shows them as an assembly and the dimensions shown are for my lathe.

The lever assembly is as follows: A piece of CRS 1 in. square x 4½ in. long was cut and cleaned up, two ¼ in. holes were drilled as shown and a 9/16 in. recess was milled to allow the passage of the locating bar (to be described later); the other end was drilled and reamed for a ½ in. hole for the lever turret. The turret was made from 1 in. drill rod as shown in the drawing. The collar for the ⅝ in. stud on the top-slide bracket is from 1½ in. round stock and is drilled and tapped for: the lever arm, which is made from ⅜ in. drill rod 7 in. long, suitably threaded for the collar at one end and for the handle at the other. The handle shown in the photographs was made from 1 in. round 303 stainless steel—rather a tough material for a trial for the set-up, but no suitable aluminium happened to be on hand; without the handle, the lever arm gave barely two to one mechanical advantage and machining the handle proved to be a rather long process. The whole of the machining was done against the template but for future applications I shall rough out the handle with angular settings of the top-slide and only do the final shaping with the template. The extra length given by the template gives a 4:1 advantage, which is ample; without the handle I found that it required considerable effort to keep the ball-bearing in contact with the template since the outward thrust of a round-nosed tool is very considerable when turning such tough stuff as stainless steel. The left-hand side of my (home-made) cross-slide was drilled and tapped for two ¼-20 cap screws to hold the 1 in. square bracket. Two jamb nuts and a



(4) Bracket for lever assembly, 1 reqd.



(5) Lever turret, 1 reqd.

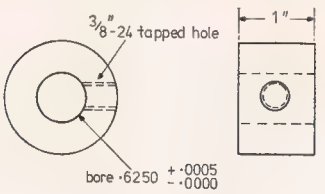
washer hold the lever turret.

The template carrier is made from 2 in. x $\frac{1}{4}$ in. aluminium and is 19 in. long (11 in. width of carriage plus 8 in. travel). The centre of the carrier has seven 10-32 tapped holes on 1 in. centres for attaching the templates in different locations and the ends each have four No. 9 drill holes spaced $\frac{3}{8}$ in. apart so that the carrier itself can be attached in different positions to suit the various tools to be used in the turning. The templates require little comment and can be made up as required; mine are made from $\frac{1}{4}$ in. thick aluminium sheet.

We now come to the locating rod. This was made from a piece of $\frac{1}{2}$ in. drill rod 28 in. long. My cross-slide is 4 in. wide and a flat, .125 in. deep x 4.010 in. long, was milled in the centre of the rod for attaching to the cross-slide; two *oversize* clearance holes were drilled for 10-32 screws and the end of the cross-slide was drilled and tapped for the screws. The half-inch holes for the locating rod in the end brackets were then laid out with a height gauge and were drilled and reamed for a *free* sliding fit. The whole assembly was then put together. On first assembly it was found that it was not easy to get the long locating rod to slide in the end brackets, hence the need for oversize mounting holes for the rod and a free sliding fit in the end brackets. My procedure now is to screw on the locating rod loosely, slide on the end brackets and clamp them to the latheways after screwing on the template carrier, and then screw up the locating rod tight—if this procedure is followed, every assembly of the attachment will go right the first time.

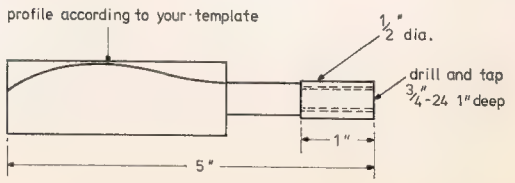
My operating procedure is first to chuck the blank to be turned and set up my turning tool. I then set up the copying attachment and set the template so that the ball-bearing is in contact at the lowest point of the template when the tool is in contact with the blank. A trial cut is then taken and if it has gone well, the ball handles securing the end brackets are loosened and the cross-slide advanced for the next cut, the ball handles being tightened for each cut. This is repeated until the whole profile has been obtained. It is to be noted that in the case of a sharp curve such as is found at the end of the handle, it is better to feed the tool downwards to the centre as it may be found that it is difficult to keep the ball-bearing in contact with the template if it is fed upwards. There is a certain amount of spring in the locating rod and this has to be allowed for in the preliminary cuts; this can be taken advantage of for the fine final cut as the cross-slide can be advanced two or three thousandths without loosening the ball handles and the set-up will still slide smoothly.

It is probable that this set-up can be improved upon but, as described, it works. The important thing is that a given profile can be obtained and can be duplicated as many times as required. It

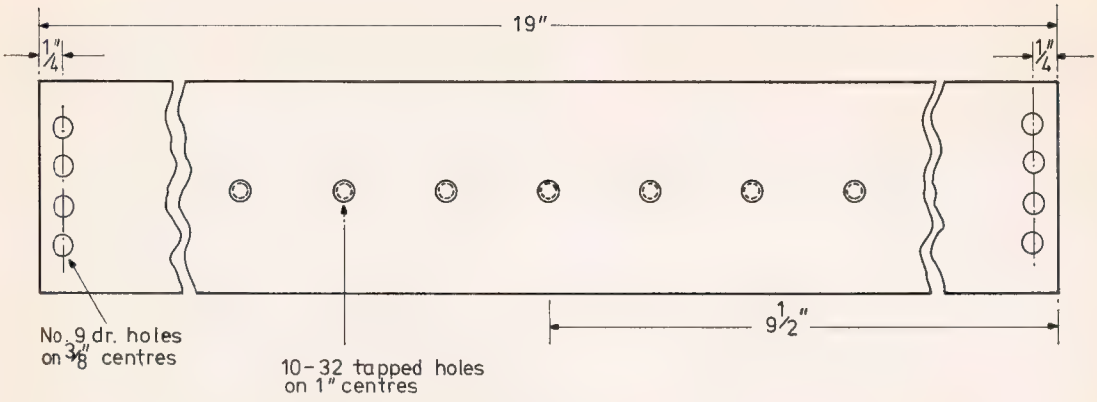


(6) Collar for lever arm, 1 reqd.

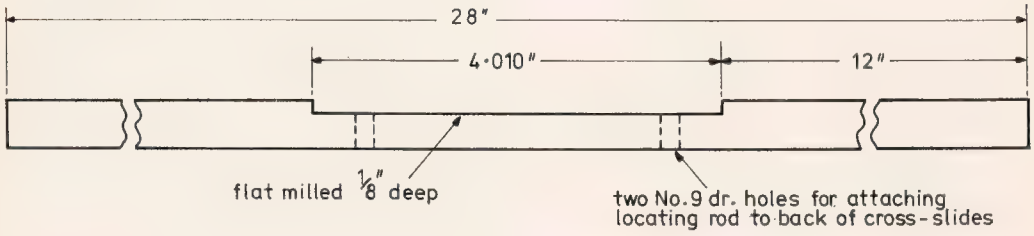
(7) Lever arm, thread each end 3/8"-24 for length indicated 1 reqd.



(8) Handle for lever arm, 1 reqd.



(9) Template carrier, 1 reqd.



(10) Locating rod, 1 reqd.

can be used for handles, cams, etc. and a little polishing up with a file and emery cloth after the turning operation will produce a very respectable result.

I have not yet digested all the stuff in the second volume and I don't suppose that I shall ever be attracted to the over-ornamentation that the Victorians loved, but there are many other attachments described that I shall probably have a stab at making up. One is a cutting frame that will allow one to turn ellipses, others are an epicycloidal cutting frame, an eccentric chuck, a chuck for turning ovals, a spherical chuck, rectilinear chuck, etc., etc., etc. I shall probably have a go at all of these at those rare times when there is nothing else going on in the shop and I wonder what to do with myself.

One thing that has to be remembered by anybody who buys this book is that most of the work described is very small, and another is that materials then in common usage are nowadays not to be had for love nor money. For instance, J.J.H. apparently uses boxwood for all kinds of trial set-ups; some of the objects illustrated are in ivory and this shows that they cannot be large because the diameter of a tusk simply does not lend itself to the construction of large objects. The elliptical cutting frame is designed for cutting shallow decorative patterns in comparatively soft material and will probably have to be beefed up considerably for cutting parts in metal. All this will pose interesting problems and I hope to inflict more articles on the editor when and if I solve them.

Doug Rundle on the Andover Club's pannier tank. See Southern Federation Rally, page 146.

JEYNES' CORNER

Air Compressors

ONE OF THE FEW THINGS still free and untaxed is the atmosphere; as we learnt at school, the composition of the atmosphere (air) is two principal gases, Oxygen and the larger proportion of Nitrogen. Air, however, is never pure—it often contains other gaseous substances such as water vapour, the proportion of which varies with the temperature and density of the air. According to the locality, there are many other impurities arising from local industries.

Now the atmosphere itself can really be regarded as compressed air, unconfirmed by any limits. Atmospheric pressure is due to its own weight, and at sea-level this atmospheric pressure at 32°F is roughly 14.7, but is usually taken at 15 lb. per sq. in. for ease of calculations. The atmosphere is generally termed "Free Air". The Zero point of pressure gauges is actually atmospheric pressure; absolute pressure is the gauge reading with the atmospheric pressure added.

There are two types of air compressor, the rotary sliding blade type, used where low pressure is required, and the piston and cylinder type of compressor which is more frequently used. These generally follow steam engine design, as far as main construction is concerned, but mechanically operated valves are seldom used, although I have seen one of American manufacture with Corliss type (without the cut-off gear) on the air inlet side. The usual method uses automatic valves, operated by suction and pressure, being either of the disc, plate, or poppet type.

In the piston and cylinder type, the air drawn in by suction is compressed by forcing it into a constantly diminishing space between the advancing piston and the cylinder ends (these may be single or double acting): thus two things are happening in producing a rise in pressure, the reduction of volume by the advancing piston, and the increase of heat corresponding to the reduction of volume.

Now, I mentioned the general following of steam engine design as regards the main construction, compressors being built in both horizontal and vertical form. Each has the inherent difficulty of obtaining a good balance; however some manufacturers built compound compressors having the cylinders at right-angles, both pistons being driven by the one crank-pin. Usually the low pressure cylinder was horizontal with the high pressure vertical, some having an intercooler fitted between; this design allowing balancing of a high degree, the vertical component cancelling out the horizontal. In fact an almost perfect balance was claimed at four points in a revolution.

Most readers will have some knowledge of the steam engine indicator to produce indicator cards; these same indicators can be applied to the compressor cylinder, and a card taken to indicate its working condition, in exactly the same manner. It must be realised that all the operations are reversed, because the steam indicator card is a record of expansion, and the air compressor card is a record of compression. That is to say, the admission line of the steam card corresponds to the delivery line of the compressor card. The expansion line of the former corresponds to the compression line of the latter, and the exhaust or back pressure line of the former to the intake of air by the latter; the compression of the former to the re-expansion line of the latter. In taking cards of a compressor, it is best to take these at the end of a run, when the temperatures are at their normal running condition.

Regarding the re-expansion line of the compressor I mentioned above, it must be realised that when the piston reaches the end of its stroke, the clearance volume is at delivery pressure, and on the beginning of the return stroke this air expands to atmosphere. There is a loss of power taken to compress the clearance volume, also a small loss of capacity.

From time to time, explosions have been recorded in compressors or receivers; such events show that a condition was present which should not have arisen in a well looked after plant. Air itself is not inflammable, and combustion or explosion can only occur when some inflammable substance is present in the air involved. This is usually explosive vapour produced by the volatilisation of unsuitable lubricating oil used in the compressor cylinder, and is always the result of some abnormal temperature increase above the flash-point of the oil. One point is that compressor cylinders do not require half the amount of lubrication that a steam cylinder does, but the oil must be of the best quality; steam cylinder oil is totally unsuitable. The ignition of carbon particles has been attributed to the failure of the water cooling circulation; where the cylinder is air cooled the critical temperature is more easily reached.

Explosions are practically unknown where there have been intercoolers between the stages of compression. Some explosions, however, had no apparent reason, and remained a mystery. I have formed my own conclusion that failure of the metal itself may well have occurred rather than

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A DRILLING JIG FOR ROUND STOCK

by

S. H. Abigail

IN A RECENT EDITION of *Model Engineer*, a contributor in describing his workshop activities mentioned that some difficulty was experienced in cross drilling round stock. From his words it appeared that when the necessity for this process arose, he adopted the somewhat dubious "hit and miss" method of lining up the bar in the machine vice by eye, and, as other people will testify, it is not surprising under these circumstances that the end of the drill tended to run out at 5 o'clock or 7 o'clock instead of 6!

I have used in my shop for several years a simple device for this operation that works perfectly every time, and was made up virtually from scrap ends. I make no claim for its originality, but for the benefit of the reader concerned and perhaps others having a similar problem, the following are the details of this accessory that can be made up in a few hours. The sizes given are from the one I use and which has covered all my work to date, but these dimensions are not important and can be varied if required.

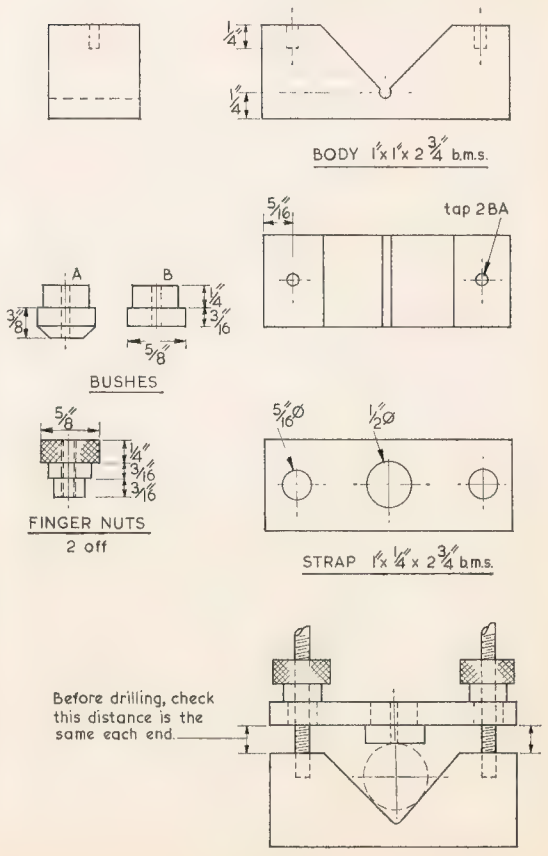
Referring to the drawing, the main block is a $2\frac{3}{4}$ in. length of 1 in. square b.m.s. A similar length of 1 in. by $\frac{1}{4}$ in. stuff for the strap is required, and when these two parts have been trued up, they should be clamped together lengthwise for drilling. A No. 26 drill is used for the two outside holes, while the centre is drilled (for the time being) with a smaller size, say a No. 40. The latter should pass right through the strap but need only be enough to mark the main block underneath.

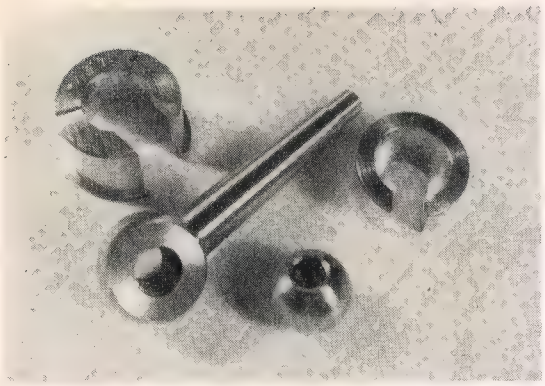
Unclamp the two pieces, and dealing with the body first, from the centre-pop left by the small drill, space out two lines each $\frac{1}{2}$ in. from the centre. Turn the block on its side and scribe out the "V" by bringing the ends of each line down to a common point about $\frac{1}{4}$ in. from the bottom. I removed the surplus metal by means of the hacksaw and then setting the block up in the vertical slide for a finishing cut with an end mill, but this part of the job can be dealt with by whatever facilities are available. Tap out the two holes in the top 2 BA and screw a $1\frac{1}{2}$ in. length of 2 BA studding in each.

The three holes in the strap can now be opened out and again accurate sizes here are not essential as the mating parts (bushes and nuts) can be turned to fit.

The finger nuts are made from $\frac{5}{8}$ in. round m.s. Turn the bottom neck so that it has an easy push fit into the strap holes but with no excessive play. Knurl the top edge. The bushes are also from $\frac{5}{8}$ in. stuff, and a small batch of these should be made up at the same time. All have a similar o.d. to fit the strap centre hole, but each one is drilled right through while still in the chuck with various size drills depending upon the size of holes likely to be

Continued on page 149





GEORGE THOMAS

SHOWS HOW TO MAKE

BALL HANDLES

THE FUNCTIONAL PURPOSE of a double-ball handle is usually to lock or to turn something by hand but it has also a certain ornamental value which is peculiarly in keeping with the machines on which it is used. To achieve the best appearance, it seems that certain proportions should be adhered to as far as is reasonably possible and I hope that I might be forgiven for offering a few thoughts on this aspect before proceeding to more practical matters.

I have measured a number of handles which looked attractive and have experimented a little on the drawing-board as a result of which I have settled on some proportions which are shown in the accompanying table and which I think will be found satisfactory, but I am very conscious of the truth of the saying that "beauty is in the eye of the beholder". I found that it was possible to arrive at satisfactory proportions from the drawing-board probably because the outstanding feature, the two spheres, when viewed in the solid will look the same from any angle. I mention this point because I once had a bout of turning ornamental objects of basically simple forms from hardwood and, having decided on the shapes by trial and error and the use of numerous French-curves, and then produced accurate templates, the resulting object was not always satisfactory and had to be corrected by eye and by feel. The drawing had shown them only in plane elevation whereas the finished article was viewed from various angles so the shape looked different and had to be modified accordingly.

Why is the handle of this particular shape? This is best answered by trying to alter it. Let us make the taper the other way round; small end of the shank to the larger ball (Fig. 1.2). It looks horrible; possibly because the smallest section is made to carry the maximum bending moment. But people who know nothing whatever about bending moments would dislike the appearance just as much as we do—it is unnatural. A tree is thickest at the point where the trunk emerges from the ground and everything from that point upwards diminishes in size. An interesting point is that this shape of handle would not look nearly so bad if the ball were left off the end (Fig. 1.3) whereas, with the stem the normal way round, one cannot leave the ball off. I can only conclude that this is because the increasing size towards the free end will tend to prevent the hand from slipping off whereas if the taper were downwards towards the free end the hand would more easily slip off and so the ball is required as a sort of end-stop. I have used a parallel shank when, as sometimes happens, the boss is not a ball but a cylinder or of conical form but a slight taper does improve the appearance (Fig. 1.4).

Sometimes the larger end ball, instead of serving as a nut, has a shaft or stem inserted and fixed in one of various ways and it might happen that the size of the stem and the fixing chosen will push up the size of the ball and, in those cases where it might not be desirable to make the whole handle larger, the proportions which have been set out will have to be modified. The man with an eye for proportion will take this in his stride and the man who hasn't will not care anyway! As fixings, I have used taper pins with the ends rounded and polished, Allen grub screws, Loctite and, for light duty, a screw in the end, pulling the handle on to a taper, as in the cross-slide handles of the Super-7 lathes.

Fig. 1.1 shows, full size, the handle which was made in order to take the photos for this article. The drawing shows a blind tapping which is sometimes preferred, whereas the sample was drilled and tapped right through, which is easier on the

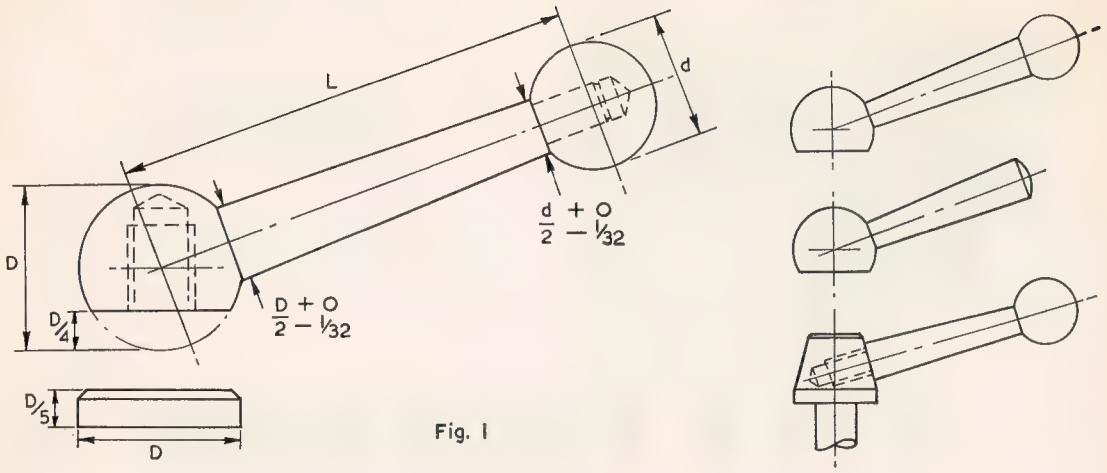


Fig. 1

tapping operation. When the thread is taken right through, the end of the bolt should, for appearance's sake, be domed to a radius approximately equal to that of the ball and be careful not to leave a knife-edge where the thread runs out.

Proportions of Handles

The large ball (D) from 2 to 2.4 times the thread diameter.

The small ball (d) from .75D to .8D.

Length of handle (L) from 2.5 to 3.5D.

Diameter of shank not more than .5 of the ball diameter and preferably 1/32 in. small (e.g. 3/4 in. ball, 11/32 in. shank).

Angle 10° to 20°.

Flat bottom turned back .25D leaving diameter of face .87D.

Table of Sizes

Screw size	D	d	Ratio d/D
2 BA	7/16	11/32	.79
1/4	9/16	7/16	.77
5/16	5/8	1/2	.80
5/16	3/4	9/16	.75
3/8	3/4	9/16	.75
3/8	13/16	5/8	.77
7/16	1	3/4	.75
1/2	1	3/4	.75
1/2	1 1/8	7/8	.78

(In the above table alternative dimensions are given for three of the screw sizes.)

Ball Turning

Before moving on to the making of ball-handles it would be as well to take a look at the various ways in which a ball, good enough for our purposes, can be turned. There are at least five different ways that I have used and they are as follows:

1. By using ordinary hand-turning tools on a hand-rest. The shape can be roughed out—usually to "octagonal" form — with slide-rest tools and finished by hand graver to radius gauge or eye. This method is surprisingly successful and quick when quite small balls have to be produced; the smaller the ball, the more accurately can it be made by eye alone. A suitable hand-rest for the Myford lathes was described in *M.E.*, 4 and 18 February 1977, and I hope soon to submit a sketch showing the modifications necessary to enable it to be used on a 3½ in. Drummond. The first of these has already been made by Mr. W. A. Carter.

2. For larger work start as above but finish the ball by using a cylindrical tool supported by the hand-rest. This method relies on the fact that any plane section of a sphere is a circle and has, I believe, been used in the past for turning ivory billiard balls. The first ball-handle I ever made (about 1921) was the outcome of a lot of experimenting with such a tool. If I were to make such a tool today it would consist of a file handle and a short length of 5/16 in. rod having a thread on the end to which various sized cutters could be attached. Such a cutter is shown in Fig. 2.2. I do not remember the proportions which I used so long ago but I imagine that the cutting edge should be about three-quarters of the finished ball diameter. These cutters should be turned from silver-steel, the bore being brought to a fine finish, free from scratches, before turning the primary bevel at about 20°. After hardening and tempering, return it to the lathe and polish the bore with a scrap of fine emery paper (about 00) on a stick and then produce the secondary, or cutting, bevel by stroking at the right angle and in a diagonal direction with a "fine" India stone and oil.

3. Form tools. If a large number of small handles has to be made then there can be little doubt that the quickest way is to use form tools for the ball-

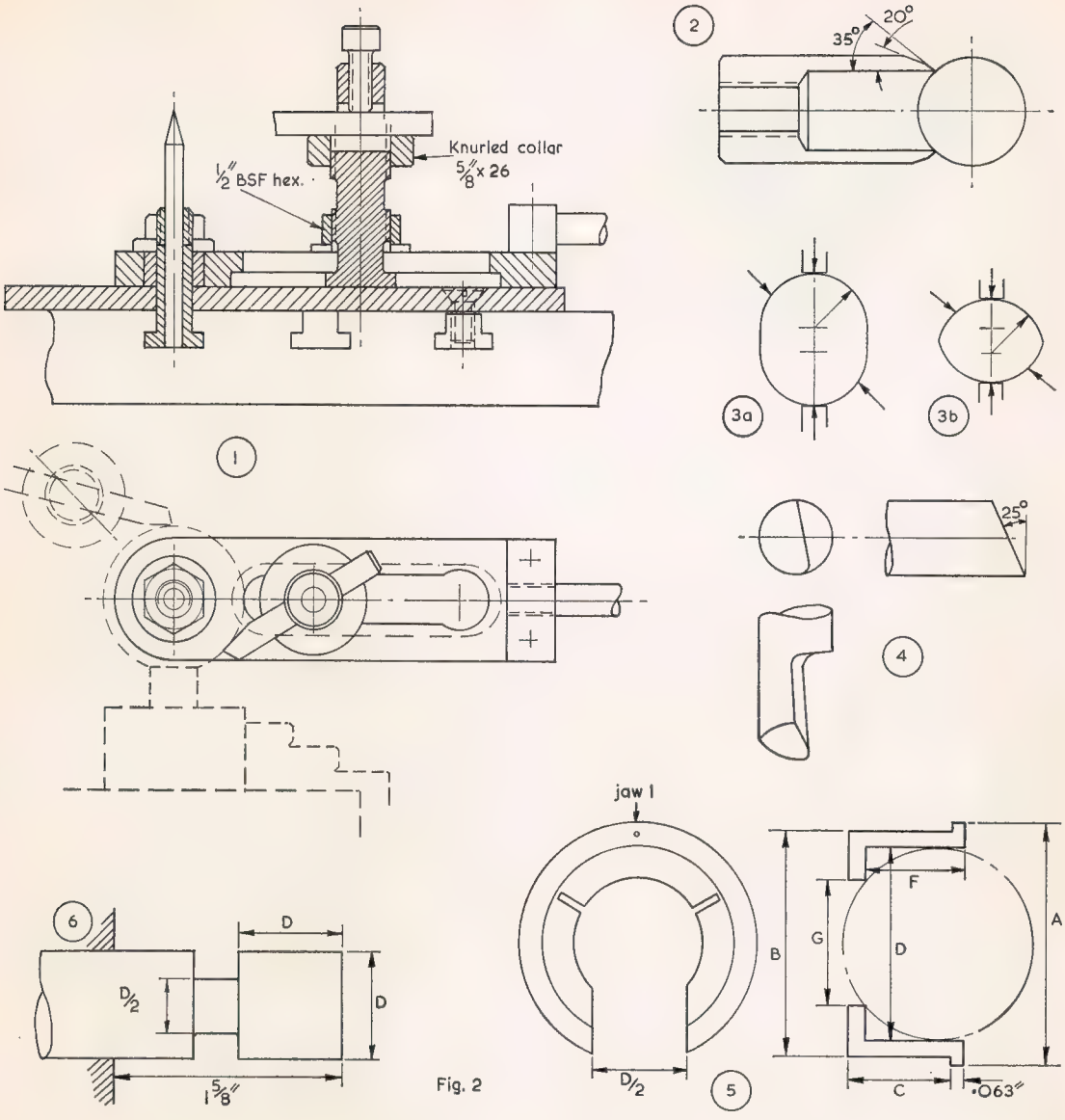
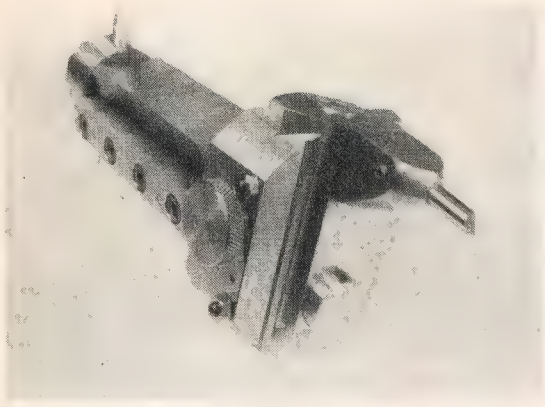


Fig. 2

ends as described in some detail by Professor Chaddock in his articles on the "Quorn" grinder (Vol. 140, pp. 484 *et seq*). Many workers do not like to use wide form-tools because of the tendency to chatter but this can be relieved to some extent by mounting the tool upside-down at the rear and working at very low speeds—the lowest possible. I imagine that it would be pretty hopeless on one of the 4 in. lathes currently available which has a bottom speed of 100 r.p.m. A rigid machine; low speed; a well-finished tool and plenty of cutting oil of the right kind should produce an acceptable result but one must guard against "scratchiness" which is caused by build-up on the tool edge and has to be "papered" out.

4. Generating a ball by swinging a single-point tool in a horizontal plane. The requirements are that the tool shall be truly at centre-height and the centre of rotation must be exactly under the centre of the ball to be produced. This type of tool is capable of turning both external and internal spherical surfaces and one of the simplest forms which I have seen was described by "Ned" (E. T. Westbury) in *M.E.*, Vol. 100, p. 582, etc. (1949). Incidentally, this volume, which contains a great deal of interesting matter, is now available



Ball turning tool for method 5.

as a reprint. I made one of these tools in order to produce the excellent little swivelling vice which was fully described in "Ned's" article. (Castings for this vice can still be obtained from Woking Precision Models of Edinburgh.)

At the time, I felt that the design of the ball-turning device was a little too basic so I made a few amendments. For one thing I didn't like the idea of the swivelling arm scraping across the top of the boring-table amongst the cast-iron dust and grit so I mounted the whole affair on to a $\frac{1}{4}$ in. steel base-plate which took all the scrubbing. The fixed tool-holder was replaced by one which could be moved in a tee-slot for major adjustments of the tool position. Many years ago I lent this device to my works where it was used to produce some accurate internal spherical surfaces on component parts of some self-aligning bearings. Eventually, as I rather anticipated, it was reduced to produce —at any rate, I never saw it again! The sketch (Fig. 2.1) shows the tool approximately as I made it. The baseplate needs to be about 4 in. wide and the pivot bolt located at about $1\frac{1}{2}$ in. from the L/H edge, and apart from this bolt the plate is further secured to the boring-table by two countersunk screws tapped into tee-nuts as shown. The bearing bush is made a very close fit in the arm and its length is reduced until the arm is almost clamped — it should be free to move but quite without shake. It will be noticed that the cutting tool ($\frac{1}{4}$ in. sq.) is turned round to contact the ball at a point about 45° from the square-on position. This is done to avoid running the arm into the chuck-jaws. In certain circumstances it pays to use a cranked tool and for internal work this is always necessary. The end of the slot for the toolpost is enlarged—keyhole form—which allows the post to be fed in from the underside.

The procedure which was adopted for setting up and using was as follows:

1. Set up material in the chuck and turn a groove down to neck diameter as shown in Fig. 2.6. Then turn, for about $\frac{1}{8}$ in. from the extreme end, to the finished ball diameter. Remove the chuck with work.

2. Fit the gauge pin into the pivot bolt and line it up to a really fine centre in the mandrel nose. Set cross-slide index to zero, remove pin and replace chuck.

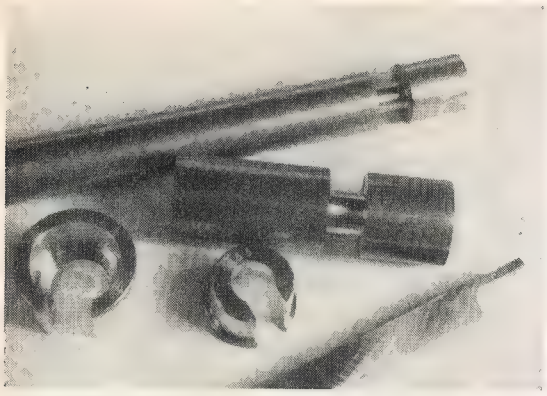
3. Bring along the saddle to the left until the centre of the hole in the pivot bolt is *just* past the end of the workpiece. Making sure that the cross-slide is still set to zero and with the arm swung round 45° to the right, adjust the position of the tool until it touches the previously turned diameter quite near to the end of the work. Lock firmly.

4. Withdraw the cross-slide a trifle and move the saddle to the left, being careful not to alter the position of the swinging arm. Adjust the saddle position until the contact point of the tool lies half-way between the end and the neck groove. Lock the saddle.

5. Withdraw the cross-slide until the tool can be swung over the corners then, with lathe running, start to feed in while swinging the tool past the corners. Carry on until the cross-slide dial reads zero. If it is desired to produce a ball to a higher degree of accuracy than is necessary for a handle we should stop feeding in before the zero point is reached and take a micrometer reading across the ball and then another one at about 45° from the last (see Fig. 2.3a). If the reading across the diameter is greater than the one at 45°, further infeed will be required. Carrying the infeed too far will result in a shape as shown in Fig. 2.3b.

This type of ball-turning tool comes in a number of guises, some of them so complicated that they almost defeat their own object. The majority which one sees described, and there have been many, are provided with worm and wheel drive to the rotating head which, to my mind, is not an improvement but rather an impediment; work is inevitably slowed down. Sometimes they are provided with a screw-operated slide for moving the tool forward and this could be regarded as an improvement but not really necessary. It is a considerable complication on an otherwise very simple tool and would not be of much, or any, use for internal work.

5. Finally, we have the much less conventional "up and over" tool in which the actual cutting tool is revolved about a horizontal axis so that it describes a circle in a vertical plane—over the top of the workpiece. This has many advantages over the previously described method but it will not do internal spherical turning as the other will. The late J. A. Radford described such a tool in *M.E.*, Vol. 134, p. 968 (4.10.66) and his particular embodiment of this form of tool has been made by



Ball holders, blanks and grooving tool.

many readers. I made one myself and incorporated a few minor modifications which will be apparent to readers familiar with the tool. As can be seen in the photo the dovetail slide has been turned through 90° in relation to the body; a gib-strip with adjusting screws is provided (the knurled locking-screw is still there, but unnecessary) and a tongue has been added to the side of the bearing block to provide means of holding in the square turret. One great advantage of this device is that a convenient means of "putting on cut" and adjusting the size of the ball produced is provided without limiting the scope of the work done.

The cutting tool recommended by J.A.R. is a piece of 3/16 in. dia. HSS—a boring-bar bit—simply ground to an angle of 10° at the end. Front clearance is provided by the 5° angle at which the toolbit is held in the tool-holder but at the sides of the tool there is no clearance at all, i.e. at the point where the tool comes into contact with the stem holding the ball. As described in the original article, the tool left a radius of approximately 3/32 in. in the corner and I found this excessive so I now use a tool of modified shape as shown in Fig. 2.4. This is so shaped that it has a very small amount of side-clearance on the L/H side but it means that care has to be taken to avoid cutting into the stem if it is already down to finished size or thereabouts. The radius left in the corner is now only about 1/32 in. and the end angle is 25° which gives a rake angle of 20°.

As with the previous arrangement, certain precautions are necessary when setting up but first and foremost the axis of the spindle about which the tool rotates *must* be *exactly* on the centre-line of the lathe otherwise it will be impossible to turn a sphere (see Fig. 2.3 a and b). As my attachment was intended for use in the square turret, the long hole through the casting was made with the body clamped in the turret so that I could be sure that the essential condition was satisfied—for all time. An overlength pattern was made and a few bars of cast-iron obtained from Stuart Turner for stock, the body was made from one of these. The procedure which must be gone through when setting up for ball-turning is, in fact, quite straightforward but I have met some people who have successfully produced this piece of not-very-simple equipment but who have run into difficulties when trying to use it.

To be continued

JEYNES' CORNER

Continued from page 139

an explosion. I was standing with the driver, when the high-pressure cylinder of a Reavell 4 stage compressor working at 1800 lb. per sq. in. disintegrated in the Daimler Power Station. There was definitely no explosion by ignition, we were within six feet of it, and would have seen any flame.

It is possible today to obtain quite cheaply a small compressor ex-refrigerator plant, and with a little doing up it can form quite a useful workshop adjunct for the builder of model steam engines. With a receiver such as an old hot water cylinder (provided with a suitable safety valve), the necessity to get up steam for trials during building, say of the motion-work before the boiler is tackled, is avoided.

A pressure of say 25 lb. per sq. in. would be quite safe, but the receiver should be placed outside the workshop and be provided with a drain. I used one quite successfully for a number of years, with my coal gas blow-pipe for the purpose of brazing in a small hearth, the shafting driving the compressor, another hot water cylinder being used as a silencer for the gas engine. It was very effective.

Quite a number of the jobs I have been engaged upon required the installation of compressed air plant, and in my apprenticeship days all the portable tools were pneumatic, compressed air being provided by an "Ingersol-Rand" and a "Peter Brotherhood" compressor. One compressor was in each power house, giving a working pressure of 100 lb. per sq. inch.

One of the chief problems in a large compressed air installation is getting rid of the water (condensate); the problem was partly solved by fitting steam traps, but in winter these readily froze, and on many occasions two of us were given the job of going round all these traps and thawing them out by burning oily waste round them.

Quite probably, many people do not realise the extent to which compressed air is used in industry, mining, and municipal and rural roadwork, to power portable tools and pumps. The air turbine centrifugal pump is a universal favourite among contractors.

SOUTHERN FEDERATION OF

Reported by D. E. Lawrence

THERE WAS A GOOD TURN-OUT for the Federation's Rally which was held at the track of the Bournemouth & District S.M.E. in September last. Around 90 to 100 people attended with about two dozen locomotives, and most had a good long run on the track. Getting in early was Ken Edge of Peterborough, whose 5 in. gauge L.M.S. rebuilt *Royal Scot* 4-6-0 must be one of the first completed to Martin Evans' recent design. The Bournemouth track is well laid with large radius curves which allow fast running and the *Scot* proved to be a real flyer, taking the long grades and wide curves in its stride.

Peter Gardner's *Mona,* which is an 0-6-2T to LBSC's design, was a contender for the "Curly Bowl" a couple of years ago and it attracted favourable comment from the judges at the M.E. Exhibition at the time. On the continuous track this engine from Bracknell showed that it well deserved its earlier pat on the back. It ran at a good consistent speed and was very steady on the rails, which showed that Peter had paid attention

Top: Winner of the Kenneth Johns Ltd. prize, Ken Cribb, receives his award.

Above: Fred Warden's (Guildford) "Simplex".

M.E.S. SEPTEMBER RALLY

Top: Bill Godwood's (Bournemouth) G.W.R. "Single".

Above. Ken Cribb takes his family for a ride on the G.W.R. County.

to getting the springing right. Before lunch all six of the host Society's standard driving cars were in use and one after the other, as drivers found they could "open up" on this fast track, they all cracked on speed racing round in a fast-moving procession; it was evident that some of them had never had such an opportunity before!

From Chingford came Ron Manning's 3½ in. gauge *Bantam Cock,* an L.N.E.R. 2-6-2 with his son Christopher in charge, and he also let this engine have its head. It was noticed that 3½ in. gauge locomotives in the hands of the more enterprising drivers were able to keep up with the bigger 5 in. gauge locomotives. Both the Andover Club locomotives were present and these are a 5 in. gauge *Simplex* and a 5 in. gauge G.W.R. 57XX 0-6-0PT; the latter is a very nice clean job, though plain, and it ran very well; the engines appeared to be well maintained and had capable drivers.

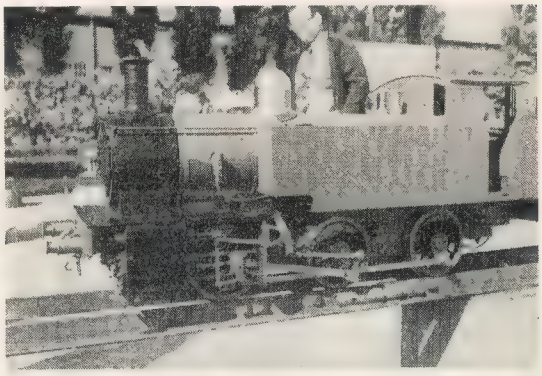
Kenneth Johns Ltd., who last year donated a prize of Sievert gas equipment, repeated their generous gesture this year and the prize for the

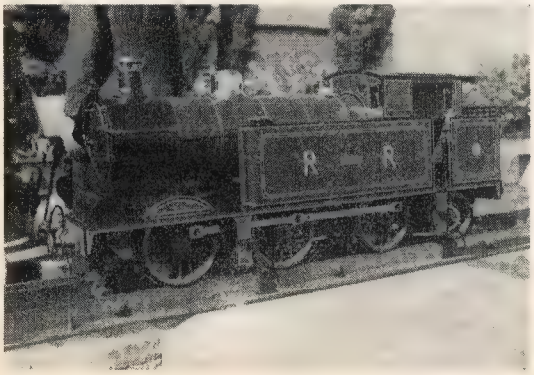
Chingford member's "Bantam Cock" performed well on the track.

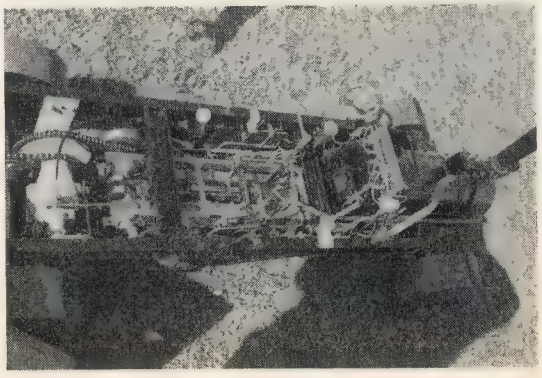
locomotive and owner who best represented the spirit of the hobby was awarded to Ken Cribb, a past chairman and very active member of the Bristol S.M.E.E., whose 3½ in. gauge G.W.R. 10XX *County* 4-6-0 could be seen racing along in typical Western style with a very keen young Master Cribb at the wide open regulator.

The hosts had arranged a show of members' work and there were some very fine models displayed. An excellent 3½ in. gauge *Britannia* Pacific was somewhat overshadowed by a magnificent 5 in. gauge G.W.R. Dean Single *Flying Dutchman* by Bill Godwood. The only castings used in this locomotive were the wheels; much of the rest of the engine was patiently fabricated or machined from the solid where castings would otherwise be used. Also displayed was a most useful heavy passenger hauling locomotive made by Harry Lee; this was a 5 in. gauge model of a G.W.R. 47XX 2-8-0 which was a very successful mixed traffic locomotive in full size. Alan Pickering had several models on display and his single-cylinder Foden type of "underfloor" engine steam wagon attracted a good deal of attention, as did his 3½ in. gauge *Mountaineer* which has been fitted with a *Linda* type cab for easy footplate access in place of the enclosed type as on the full-size job.

In spite of the bakers' strike, the good ladies of the Society managed to stock up with plenty of provisions so that the arrangements for refreshments went ahead as planned, and their efforts were greatly appreciated by us all. This was a good Rally in fine weather and much enjoyed by all there.







Top right: Andover club's "Simplex".
Bottom right: A. Pickering's underfloor type steam wagon.
Below: "Mona" by Peter Gardner (Bracknell).

Above: Ken Edge's rebuilt "Royal Scot".
Top right: Howard Lamb's (Yeovil) "Mona".
Bottom right: Reg Holdstock's (Maidstone) "Sally".
Below: Alan Pickering's (Bournemouth) modified "Mountaineer".

DRILLING JIG —

from page 140

needed. I have found that five bushes with holes drilled Nos. 50, 40, 30, 20 and 15 have coped with all my own work, but constructors must decide on the selection individually. For easy identification stamp the drill number on each bush.

Any such hole drilled in a piece of round stock can be opened up to a larger size without the use of the device a second time, because if the bar is held only in the machine vice, the second and larger drill will follow the route of the hole already there.

The form of bush shown at B will be suitable for the majority of jobs but to deal with small diameter work, that shown at A will be necessary. The extra length of flange and the chamfer will allow the bush to sit well down in the "V" to hold stock of say $\frac{1}{4}$ in. or less. Bushes can be turned up in minutes should one be required for a special one-off project.

A bush suitable for the size hole required in the stock is inserted in the strap centre hole flange underneath. The bar to be drilled is centre-popped and then pushed through the "V" and the pop located under the drill hole. The clamp bar or strap is then tightened down by means of the finger nuts, first one side and then the other until (and this is important if the device is to do its job properly) the underside of the strap is parallel with the top face of the main block. Measure each gap at the ends with an inside calliper if there is sufficient room, otherwise check with a steel rule. The latter method is quite satisfactory because we are not splitting hairs by dealing with dial gauge differences. Just get it as near as possible by eye.

Transfer the unit to the drilling machine, and run the appropriate drill through the guide bush.

"HOLMSIDE"

A 7¼ in. and 7½ in. gauge National Coal Board saddle tank loco by Martin Evans

Part X

From page 1426

THE MOST IMPORTANT fitting on any locomotive boiler is surely the regulator. Nothing is more annoying than a regulator that fails to close properly, or that is one of those all-or-nothing kinds that most of us have experienced at one time or another.

Many locomotive builders seem quite satisfied with the simplest type of all—the plain screw-down regulator, using a fairly coarse thread. This kind is certainly much the easiest and quickest to make, though it suffers from two minor disadvantages—it tends to lock solid after use if left in the closed position at the end of the day's steaming, and it calls for a rather large rotary movement in order to obtain a good opening for steam.

As I mentioned when dealing with the 3½ in. gauge locomotive *Greene King,* my own favourite regulator is the slide valve type, which is based on that used by Stanier on the old L.M.S. It can be used on *Holmside,* but is not ideal in domes of great height, owing to the length of the levers involved.

In the event, I decided to draw out two types, the slide valve type and the Stroudley variety, so builders can take their choice. The Stroudley regulator sits very nicely in a tall dome (all Stroudley engines had fairly tall domes, though considerably smaller than those in use on most other British railways of his time) and the long levers, being situated on one side of the "stand", are no disadvantage.

To deal with the slide valve regulator first, the stand or body of this is best made from a casting in gunmetal, so perhaps some of our castings suppliers will be willing to oblige once more. In this case, the valve could be made from drawn bronze or stainless steel, the latter metal working nicely on cast gunmetal. If built up, the stand could be made from 1 in. square material, with the steam pipe boss silver-soldered on. This boss should be deeply countersunk, to make it easier to start the steam pipe into the threads.

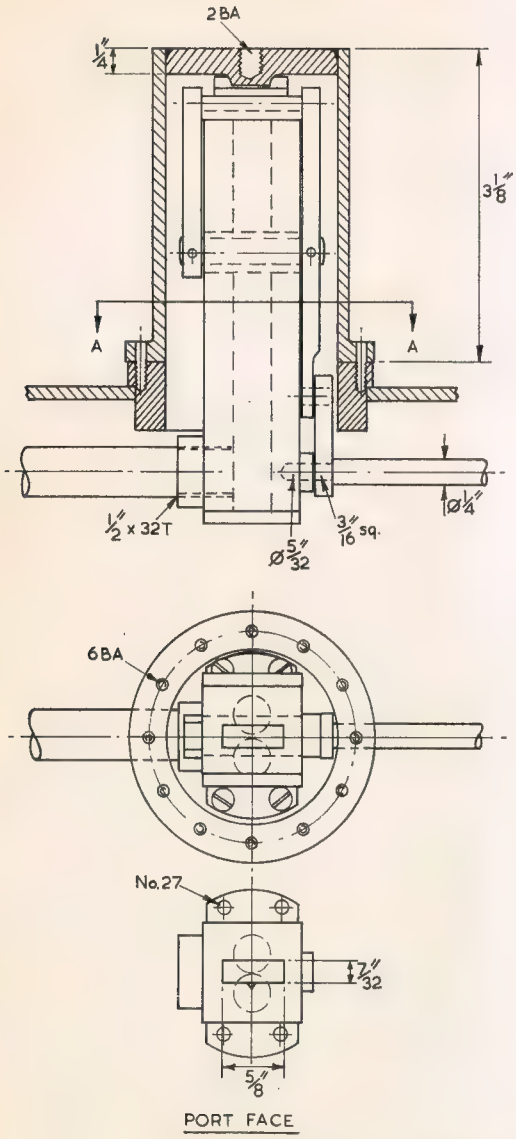
The steam port is rectangular, 5/8 in. x 7/32 in., which should pass all the steam the cylinders can use. It can be milled out, using an end mill about 5/32 in. dia. to start off with, finishing with a Woodruff or similar cutter, to obtain the square corners, though these can be left radiused if preferred. Two ⅛ in. holes are then drilled from the base, communicating with the port, a slice of brass about ⅛ in. thick being silver-soldered across the bottom.

Next a bearing for the central spindle is made up; this can be turned from gunmetal or phosphor-bronze to a shade over 5/16 in. dia. and bored ¼ in. dia. for the spindle. It is then pressed home flush on each face of the stand. If made larger in diameter, it would interfere with the steam flow to an unacceptable amount.

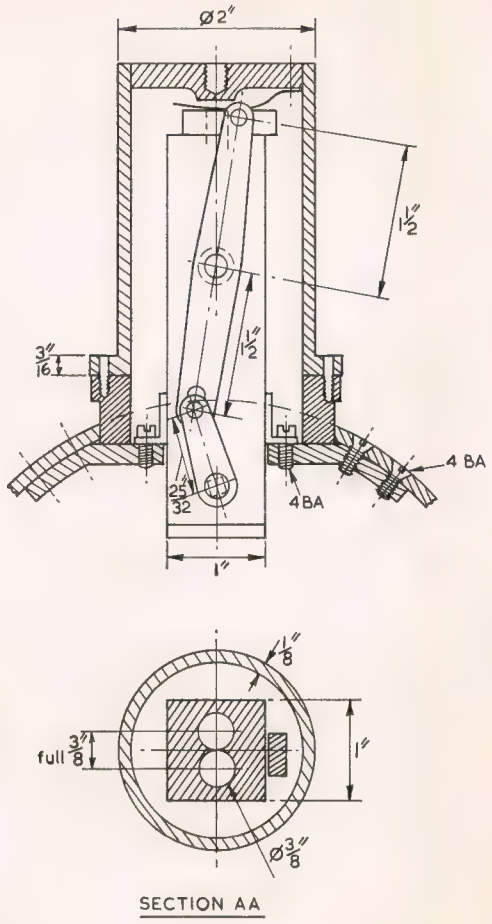
To fix the stand inside the inner dome, angles are silver-soldered on each side of the stand as shown, these being a shade under 1 in. long and of 1/2 in. x 5/16 in. x 1/16 in. section. These angles rest on two strips of hard brass about 1½ in. long and of width equal to the length of the angles. They should not be thinner than 3/16 in. to make a strong job. They can be inserted inside the boiler and held up to the underside of the barrel by 4 BA countersunk brass screws. 4 BA brass (or gunmetal or stainless steel) cheesehead screws are then used to hold the stand in position.

The three levers are all 3/16 in. thick and could be made from hard brass, gunmetal, stainless steel or even nickel-silver, if anyone has any of that rather nice metal in the required thickness. The short operating lever has a squared fitting for the operating spindle, its upper end being furnished with a pressed-in plain pin of about ⅛ in. diameter.

The other two levers are made a press fit on their cross-shaft, which could be of stainless steel, but they should be pinned in addition, as it is essential that they move together to operate the valve. The valve has a plain slot, matching the port in the top of the stand, and it is kept on the port face by a light spring made from hard phosphor-bronze about 26 s.w.g. This spring is riveted to



SLIDE VALVE REGULATOR



SECTION AA

the underside of the top of the inner dome, and it must of course be slotted out to allow the steam to pass through it into the port.

The inner dome is shown in my drawing as in one piece, but it could of course be made from brass or copper tube 2 in. dia. x $\frac{1}{8}$ in. thick, with a flange of 3/16 in. thickness silver-soldered to it. The top is sealed off and has a 2 BA "blind" tapped hole, which can be used to secure the outer dome cover in place.

No stops for the operating lever are shown in my drawing, but these can be fitted quite easily direct to the stand, unless the builder prefers them incorporated in the backhead flange (as shown with the Stroudley type regulator).

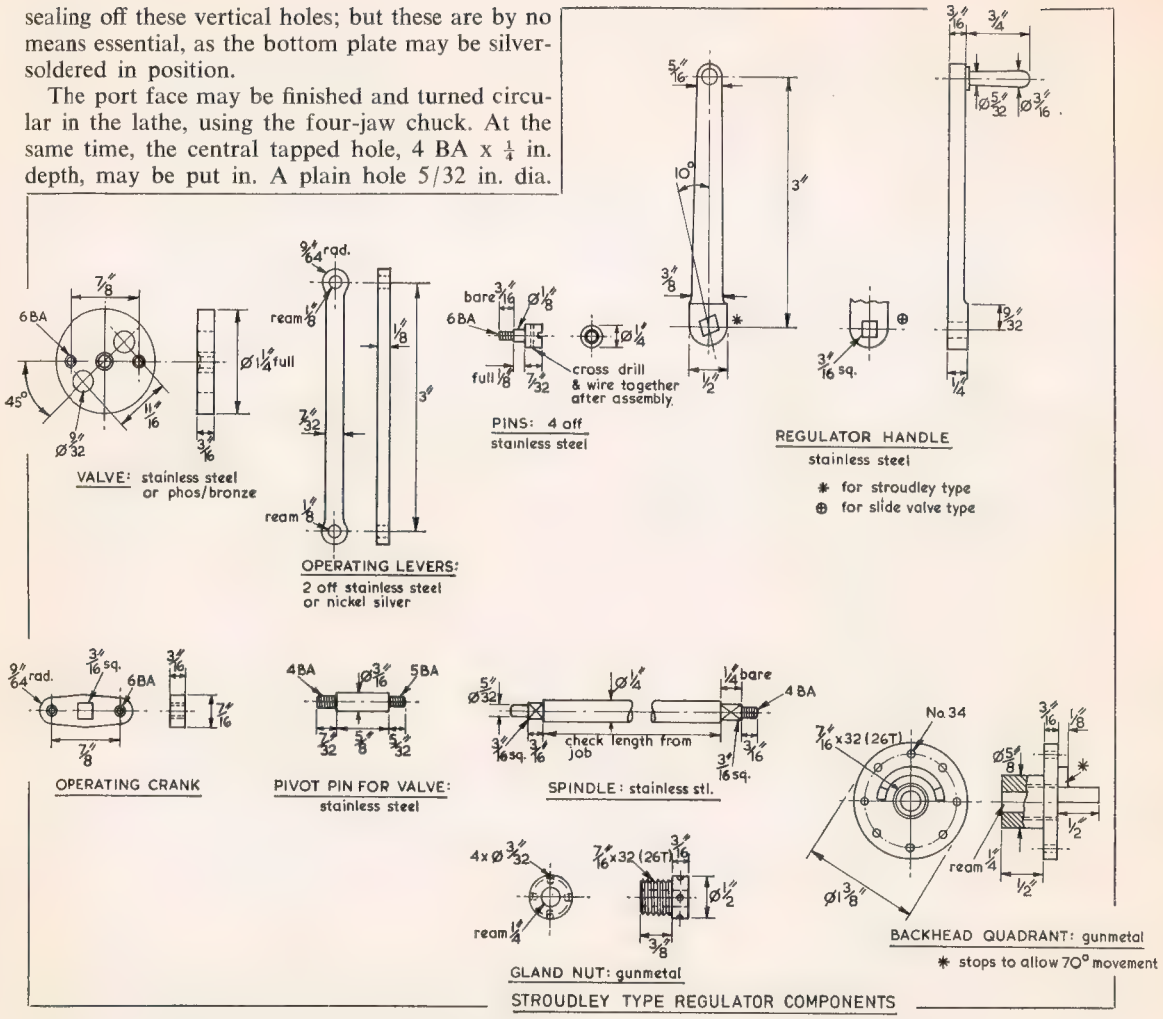
I forgot to mention that a second boss is required at the bottom of the stand, to receive the end of the operating spindle (which is of $\frac{1}{4}$ in. dia. stainless steel), this boss being neessary to give clearance for the levers. It will either be incorporated in a casting, or can be separate and silver-soldered in place if the stand is being built up.

Stroudley Regulator

The Stroudley type regulator seems rather more in keeping with an Industrial tank locomotive. Its stand is of more elaborate shape than that for the slide valve regulator. Again a casting would be very convenient. The casting is drilled, countersunk and tapped for the steam pipe as before. Then two 9/32 in. dia. holes are drilled from the base, being met at right-angles by the two ports, of the same diameter. My drawing shows the stand furnished with two lugs at the base, to take screws

sealing off these vertical holes; but these are by no means essential, as the bottom plate may be silver-soldered in position.

The port face may be finished and turned circular in the lathe, using the four-jaw chuck. At the same time, the central tapped hole, 4 BA x $\frac{1}{4}$ in. depth, may be put in. A plain hole 5/32 in. dia.

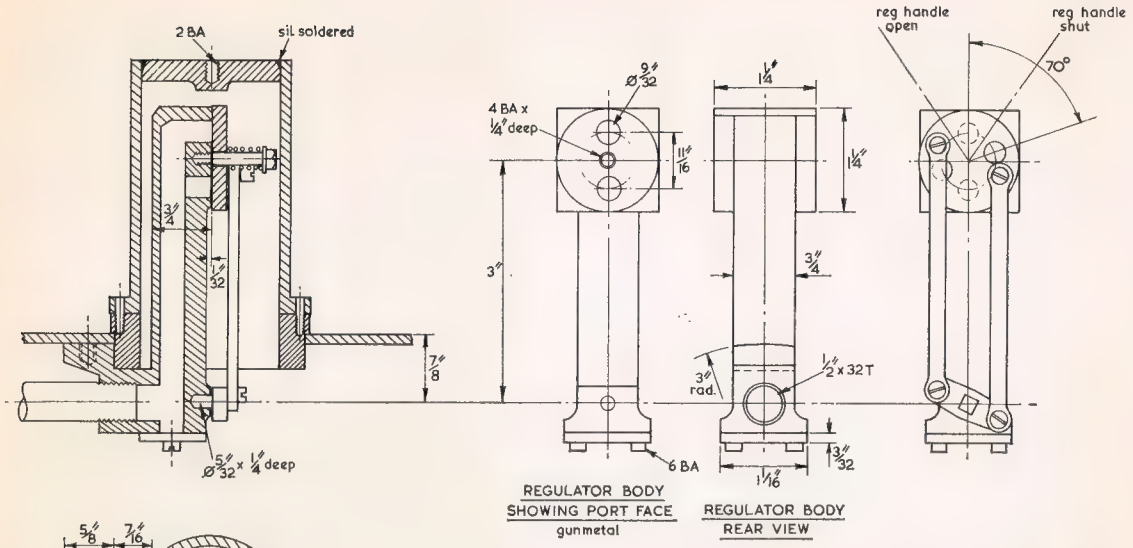

VALVE: stainless steel or phos/bronze
OPERATING LEVERS: 2 off stainless steel or nickel silver
PINS: 4 off stainless steel
cross drill & wire together after assembly
REGULATOR HANDLE stainless steel
* for stroudley type
⊕ for slide valve type
OPERATING CRANK
PIVOT PIN FOR VALVE: stainless steel
SPINDLE: stainless stl.
check length from job
GLAND NUT: gunmetal
BACKHEAD QUADRANT: gunmetal
* stops to allow 70° movement
STROUDLEY TYPE REGULATOR COMPONENTS

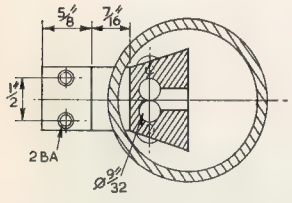
and $\frac{1}{4}$ in. deep is drilled at the base, in line with the steam pipe, for the end of the operating spindle.

Again, stainless steel would be desirable for the valve, which should be turned to very slightly larger diameter than the circular port face with advantage. The valve needs a good countersink on its inside face, and this face might be finished off by lapping on a surface plate or something nice and flat. It carries two pins set at the rather unusual angle of 45 deg. from the ports. This became necessary because the total movement to give a full port opening, plus an adequate "bridge" when the regulator is shut to prevent leakage, came out at 70 deg. These pins are best made in stainless steel or gunmetal, the same material being used for the similar pins in the operating crank. As these pins are only screwed into the valve and operating crank and as it is vital that they do not work loose in service, their heads are made oversize and cross-drilled, so that a wire can be inserted through each pair and twisted up, 20 s.w.g. stainless steel wire being ideal for this job.

The pivot pin for the valve is threaded 4 BA where it screws into the stand, and this thread should be made a shade oversize, as this pin also must not work loose in service. Its outer end can be threaded 5 BA, and fitted with a nut and washer; the spring is wound up from stainless steel or hard bronze wire about 20 s.w.g.

A simple regulator handle is shown, preferably made from stainless steel again, a section of $\frac{1}{2}$ in. x $\frac{1}{4}$ in. being required. Note that the 3/16 in. square hole has to be set over at an angle of 10 deg. for the Stroudley regulator only, so as to give an equal radial movement of 35 deg. each side of the vertical. The backhead flange and quadrant is fitted with stops, which are silver-soldered in place, allowing for the 70 deg. movement, but if this type is used with the slide valve regulator, a movement of only 35 deg. will be





STROUDLEY TYPE REGULATOR

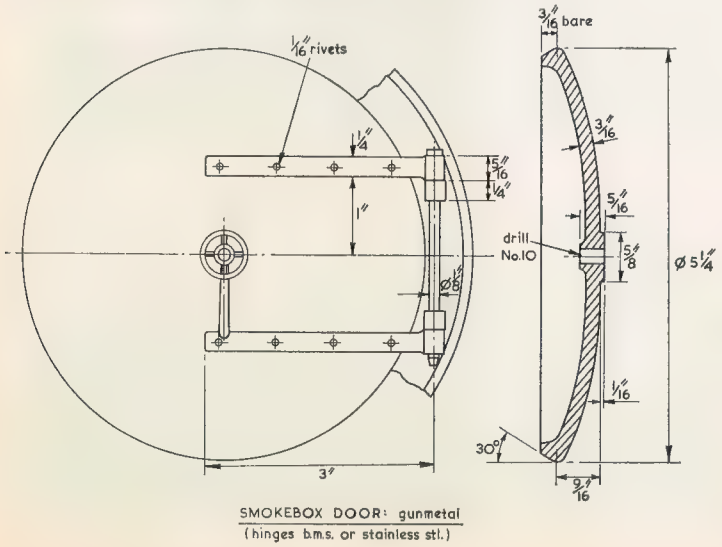
required, just half that for the Stroudley regulator, in fact!

Smokebox Door

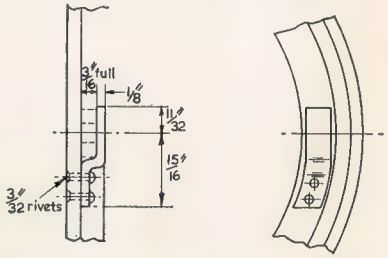
To finish off the smokebox, we require the door, for which a gunmetal casting would be most convenient. To make a neat job of this rather prominent part, the hinges are best made separately, rather than being cast on the door itself. If so, they can be sawn and filed, or milled, from 5/16 in. square mild steel, stainless steel or nickel-silver, the hinge bosses being drilled ⅛ in. diameter. They are riveted to the door with 1/16 in. rivets, snap-head or countersunk as preferred.

The smokebox door is turned with a 30 deg. edge, to match the same angle machined in the front ring. Provided this edge is kept clean, it will ensure that the door fits really air-tight. This method is probably better than the more usual front ring finished off flat on the outside.

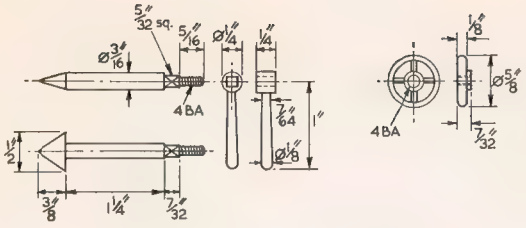
To ensure that the crossbar does not bend when the "dart" is tightened up, two lengths of ½ in. x 3/16 in. mild steel are used for this item, riveted together as shown, with a ¼ in. gap between the two. It is not secured inside the smokebox in any way, but just rests inside two brackets riveted to



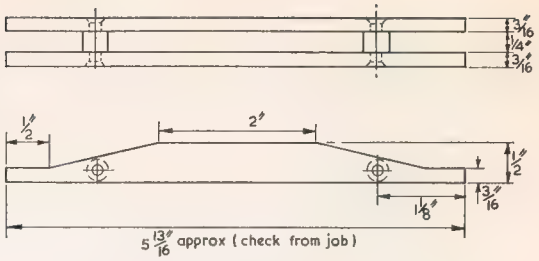
SMOKEBOX DOOR: gunmetal
(hinges b.m.s. or stainless stl.)



BRACKETS FOR CROSSBAR: b.m.s.



SMOKEBOX DART HANDLE & WHEEL:
stainless steel



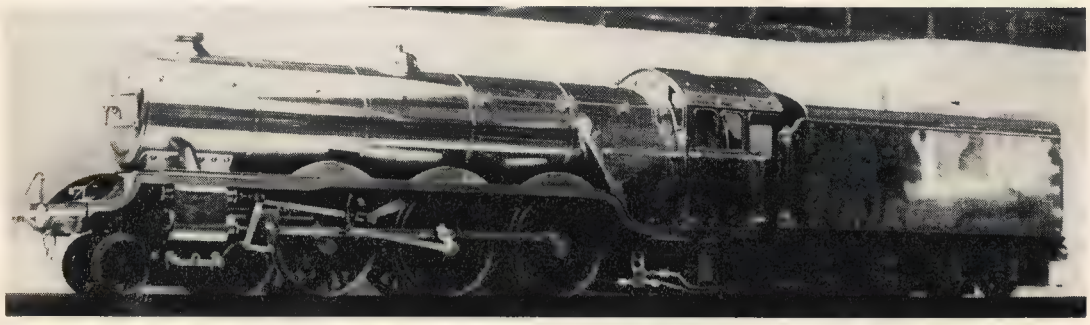
SMOKEBOX CROSSBAR: b.m.s. or stainless stl.

the inside of the front smokebox ring. It can thus be taken out quite easily, when sweeping the tubes, etc.

The dart, handle and wheel can now be made up; these also would look very nice in stainless steel, the handle having a square hole to match the dart, while the wheel is tapped 4 BA. Finally, the smokebox door pin is best fitted comparatively loosely, otherwise the door will not register "fair" in the recess in the front ring.

To be continued

These three locos were all built by Mr. O. H. J. Rapley and photographed by Mr. Alan Novelle. They are, from top to bottom, 3½ in. gauge Caledonian "Rob Roy", 2½ in. gauge "Flying Scotsman", and 3½ in. gauge 2-6-2 "Betty".



A Light Compound Steam Tractor

at 2 in. Scale

Part VIII

by John Haining

From page 42

THE STEERING WHEEL is on the left side, the opposite side to the reversing-lever, for obvious reasons. The steering spindle is held at the top in a bracket bolting to the left-hand hornplate, running down through the belly or fore tank via a cast-iron sleeve extending diagonally from tank tap top plate down to the front plate, being held at the lower end in a small bracket riveted to the tank front.

The cast-iron sleeve through which the spindle runs has a flange at both ends, the top one being a loose one to allow the sleeve to enter the tank. The worm and wheel are fully detailed on the drawing, and are produced, for those builders who prefer to buy complete, by the Reliance Gear Co. Ltd., St. Helen's Gate, Almondbury, Huddersfield. The worm is stainless steel, stock number W.16.S.45, the wheel, bronze, is stock number W.16.B.37—S.20, on page 173 of this firm's catalogue. The bronze wheel will have to be bushed to bring it down to our shaft diameter, otherwise all details are carried.

Starting the differential gear

The differential or compensating gear was referred to briefly in Part VI, which also includes a section through the engine on the hind axle C.L.

Since completing the drawing I have very slightly modified the compensating gear assembly to enable proprietary bevel gears and pinions to be used, by the addition of a spacer between the nearside hub and its neighbouring bevel gear. This avoids the necessity of an extra wide hub this side, and enables the two bevel gears to be of identical dimensions except for the double keyways set at 90° to each other in the inboard bevel gear. This latter gear is, of course, keyed to the axle and rotates with it at all times, whereas the outer bevel gear must be a running fit on the axle shaft which is itself free to revolve inside both the wheel hub and the bevel gear when the driving pins are withdrawn.

The majority of those readers engaged in building this engine will, I imagine, prefer to obtain the compensating gears complete from trade, as I am doing. Those others who intend cutting their own bevel gears and pinions will need no reminder that when milling these gears with a rotary formed cutter it will be necessary to take two cuts through each tooth space, with the gear blank slightly off-centre, first on one side and then on the other to obtain a tooth of approximately the correct form. The gear blank should also be rotated proportionately to obtain the proper tooth thickness at both the large and small ends, the British Standard forms of tooth for straight bevel gears being generated from a straight-sided tool having an angle of 20°.

The Ransomes works drawing of the compensating gear and winding drum shows a small pin passing through the outer bevel gear and projecting into a boss on the compensating gear housing, the location of this in relation to the winding drum, itself free to revolve on the compensating gear rim, prompting me to seek advice from Gordon Limb, owner of a tractor himself, and a mine of information on these engines. I asked whether this was intended as a differential lock or an insert-pin in lieu of a winding drum catch, usually fitted on hind axle winding drums. In no time at all I had a reply giving me some other dimensions I had queried and the information that no catch was fitted and as the drum could run freely on the compensating gear rim (for running the rope out when moving forward, for instance), to provide drive to the winding drum when winding-in, a bolt or pin was inserted through a hole in the outer rim of the drum into a lug on the bevel gear itself.

This clarified the position with regard to the full-size engine but left me with the choice of following exactly the rather complex form of winding drum, compensating gear housing and final drive gear castings, or slightly simplifying the arrangement internally to make construction in 2 in. scale rather easier and certainly cheaper while retaining the external appearance.

As I have arranged the final drive assembly, drive is transmitted through the second-shaft gear on the nearside of the engine to the final drive spur gear ring, which is bolted to the compensating gear housing, the gear ring sitting in a machined recess on the outer edge of the housing.

Inside the housing, spaced equally at 120°, are the three bevel pinions running freely on stub shafts which are a push-fit in the centre of the

housing. Three apertures in the housing casting accommodate the pinions, allowing them to mesh with both bevel gears.

The winding drum inner flange is bolted to the compensating gear housing, so that as well as retaining the bevel stub shafts in position, the drum turns only with the final drive gear ring, it being necessary to partially withdraw both driving pins through the hub lobes to allow independent rotation of the winding drum. This does not allow the drum to rotate freely on the compensating housing for running the rope out, but with the small modification shown in Fig. 1 this is easily made possible.

The inner row of setscrews through the housing are used to secure a retaining ring fitting over the inner flange of the drum, which is machined down to allow the ring to fit over a stepped diameter. Where the drum would register on the protruding diameter of the housing in the first method of assembly, a clearance of .003 to .004 in. is allowed, so that the drum is free to rotate until prevented from doing so by insertion of the pin through a lug cast on the inside of the drum rim into the compensating housing. Thus to use the drum for winding, both driving pins will still have to be partly withdrawn and the small locking pin screwed home into the housing to drive the drum itself.

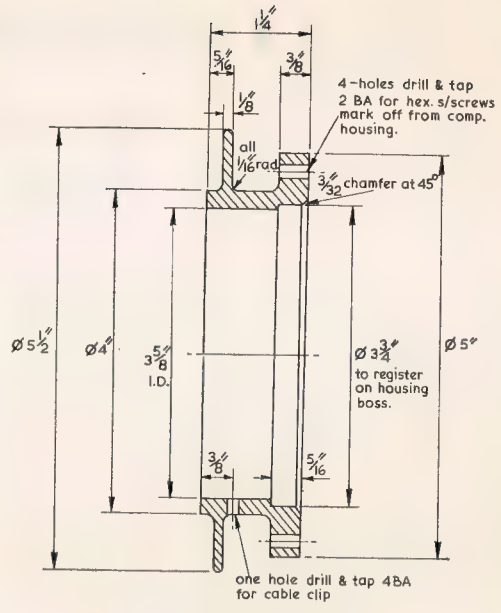
Fig. 2 shows the compensating gear with a spacer positioned between gear and wheel hub.

The position of the three bevel pinions is critical in as much as there must be an equal number of pitches between each, otherwise the differential assembly will lock. With bevel gears of 60 teeth each there will be 19 teeth between bevel pinion centre lines which will be at 120° to each other.

The Ransomes drawings show both the bevel gear nearest the hornplate and the driveplate for the offside wheel with two keyways each. As the bevel gear boss is fairly narrow I have retained the two-key arrangement but have only called for one on the rather longer drive plate.

Castings are now becoming available for "Clopton", and I am looking forward to collecting the hind axle boxes and the centre block axle bearing from Loco Parts at Avonmouth in the near future, after which I can start assembling the hind axle and springing.

Having bolted up the hornplates and lined up the crankshaft, second shaft and hind axle apertures, it is not a good thing to disturb everything by removing one hornplate in order to allow assembly of the hind axle parts, so the best plan is to insert one axle box into its hole in the hornplate—it doesn't matter which side is dealt with first—and then proceed on the following lines. Bolt the one axle box in position, then push the



WINDING DRUM 1 off c.i. or g.m.
(see mod. below to allow free fitting drum)

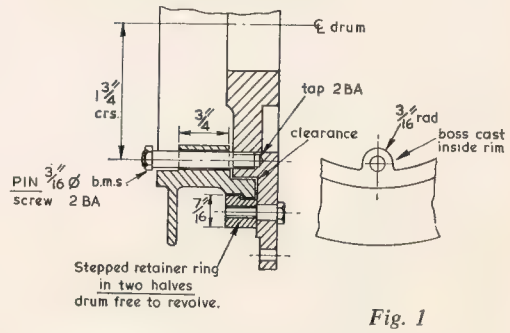


Fig. 1

centre block bearing through the opposite hornplate aperture, halting it *before* it enters the axle box opposite to insert the 3/16 in. dia. centre bolt, which has to be threaded up through the hole in the lower face and then up into the top boss. Push the axle bearing right home into the axle box and before the other axle box is pushed into its location, don't forget to follow the same procedure with the centre bolt for this side. Once the axle bearing is in position in both axle boxes it is too late to fit the centre bolts, as the only means of access is through the bottom hole in each end length of the axle bearing.

The square ends of the centre block axle bearing must be a slide fit in the square axle boxes, on each side face, but are shown on the Ransomes drawing positioned exactly on the axlebox centre line with equal clearance at top and bottom. Obviously the clamp and centre bolts will require

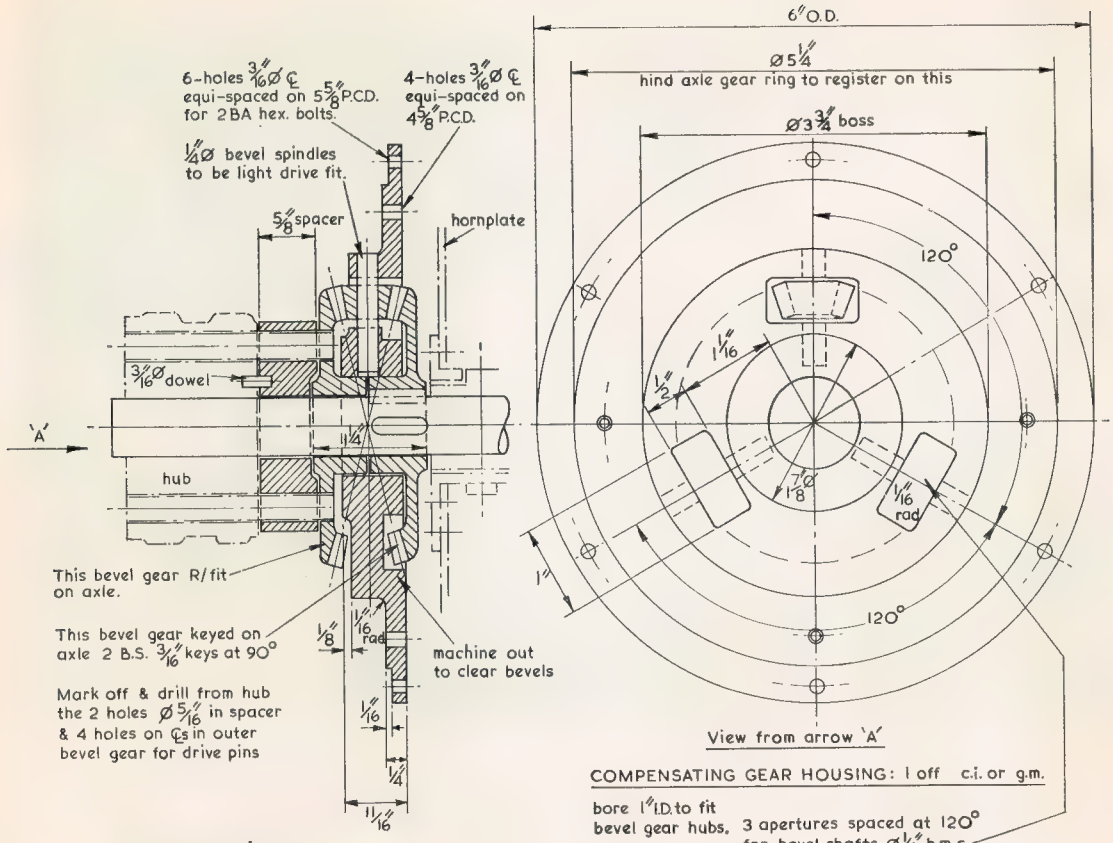

6-holes 3/16Ø ℄ equi-spaced on 5 5/8 P.C.D. for 2BA hex. bolts.
4-holes 3/16Ø ℄ equi-spaced on 4 5/8 P.C.D.
1/4Ø bevel spindles to be light drive fit.
5/8 spacer
hornplate
3/16Ø dowel
'A'
hub
1/4
This bevel gear R/fit on axle.
This bevel gear keyed on axle 2 B.S. 3/16 keys at 90°
1/8
1/16 rad
machine out to clear bevels
Mark off & drill from hub the 2 holes Ø 5/16 in spacer & 4 holes on ℄s in outer bevel gear for drive pins
1/16
1/4
1 1/16
SECTION THRO' COMP. GEAR SHOWING SPACER BEHIND HUB
6" O.D.
Ø5 1/4
hind axle gear ring to register on this
Ø3 3/4 boss
120°
1 1/16
1/2
1 7/8 Ø
1/16 rad
1"
120°
View from arrow 'A'
COMPENSATING GEAR HOUSING: 1 off c.i. or g.m.
bore 1" I.D. to fit bevel gear hubs, 3 apertures spaced at 120° for bevel shafts Ø1/4" b.m.s.

Fig. 2

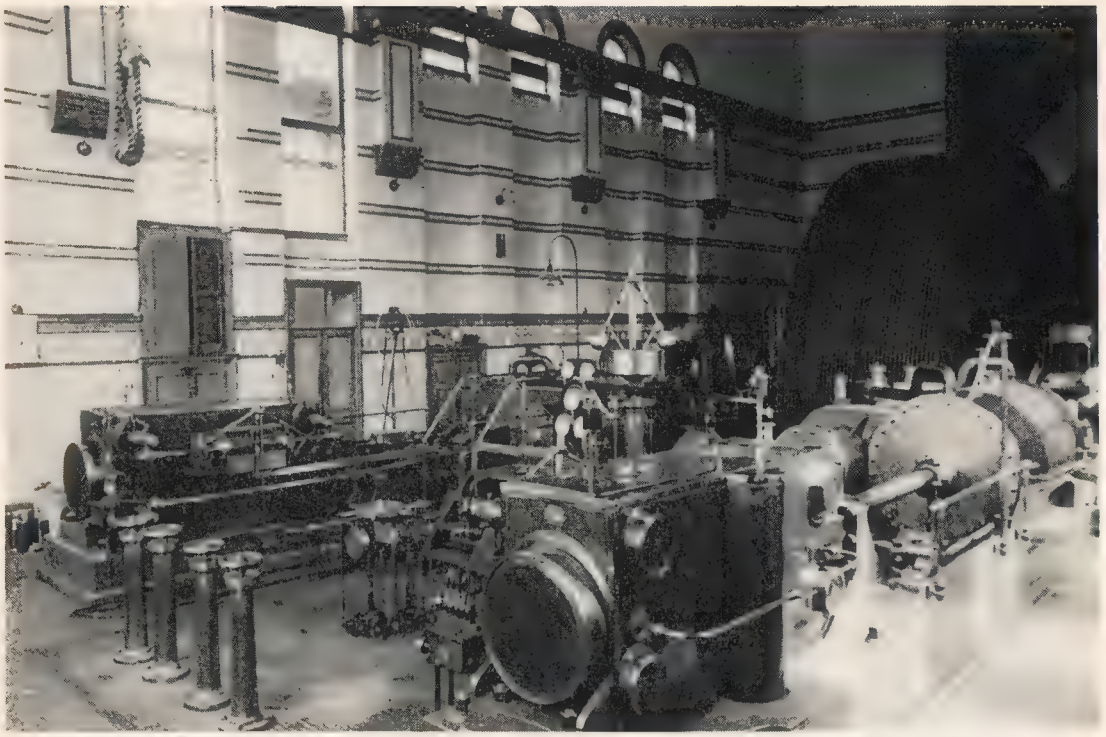
Bevels gears: 2 off b.m.s.
3" pitch Ø. 60 teeth 20 D.P.
Hubs 1"Ø 5/8" long each 5/8 I.D.
Bevel pinions: 3 off m.s. or ph. br.
3/4" pitch Ø 15 teeth 20 D.P.

adjusting on assembly to give the required spring loading against the weight of the engine, the actual bearing up and down movement within each axle box being very limited.

Now for the bad news: although I have worked to the official works drawings, converting full-size to 2 in. scale with as little alteration as possible, the axles boxes have ended up 1/32 in. higher from centre line than the hornplate aperture through which they must pass, and regretfully I had to get down to removing the unwanted 1/32 in. by filing the top of the hole to clear the thicker top part of the axle box. This latter could be reduced by the required amount, to suit, but I do not want to reduce metal thickness in this area and increasing the hornplate hole height is the obvious answer. After all, the exercise will help to keep us all fit—I hope!

The whole of the hind axle assembly is designed to suit hornplates exactly 4 1/8 in. apart, so any small variation due to excessive width, over the hollow stay bosses, for example, from this figure will have to be allowed for when assembling the bearings. I noticed that Ransomes drawings showed the clamp bolts fitting so closely against the axle boxes that the long bolts had flats for that part of their length adjacent to the axle box sides, quite drastically reducing their cross-sectional area. This was obviously done to clear the boiler backhead when the spring assemblies were turned the other way up as per the small note on the drawing I mentioned previously, as practically no clearance is allowed between the forward edge of top and bottom crossbars and backhead. I do not want to do the same with the 4 BA clamp bolts on the model although if all dimensions are adhered to, all should be well. However, if anyone does run short of clearance because the boiler is set fractionally further back than it should be or the backhead protrudes too far out, all you have to do is grind a small flat on the forward edge of the crossbars

Continued on page 161



Double tandem Corliss Mill Engine of 1500 i.h.p. (by courtesy of Northern Mill Engine Society Ltd.)

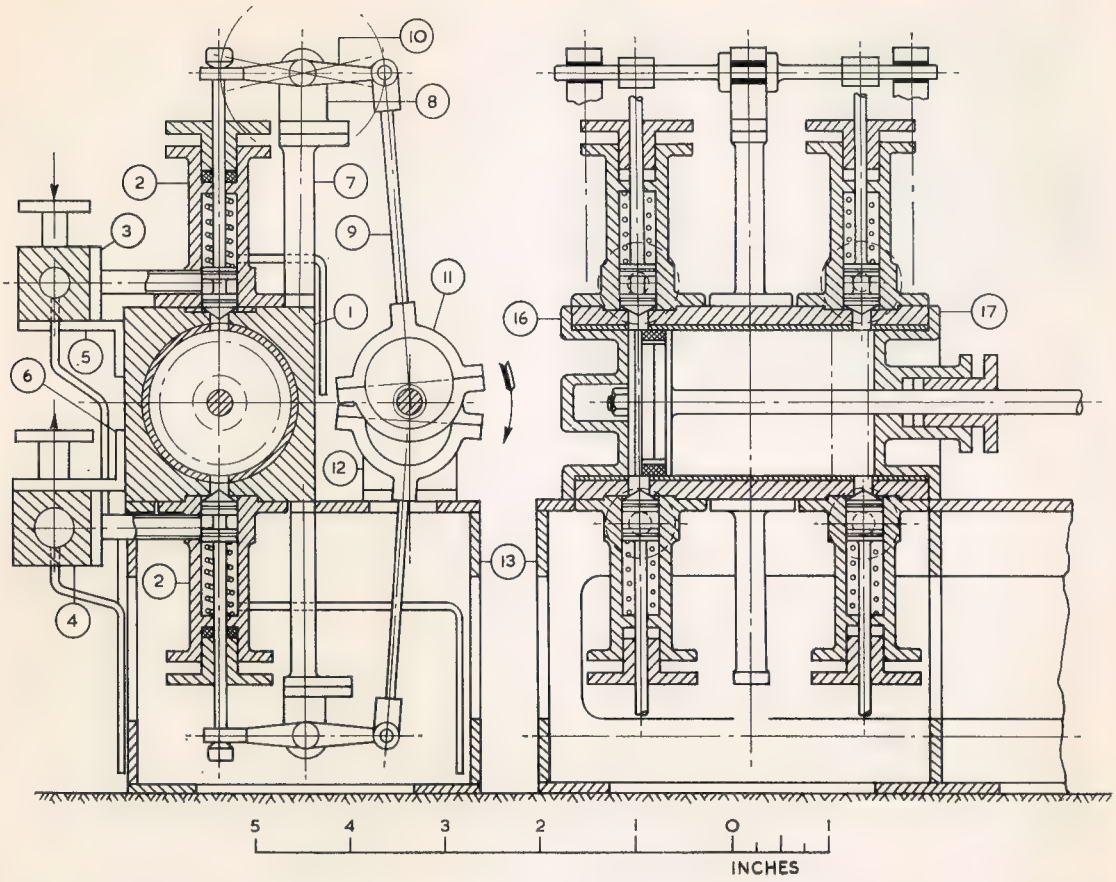
CORLISS AND DROP VALVES ON LARGE MILL ENGINES

by Alan Haworth

PRIOR TO THE introduction of the Corliss valve in this country, most prime movers were fitted with the basic D-slide valve. In the early years little improvement, if any, was made to these valves. Admittedly there was the so-called trick valve and the odd expansion valve in which the point of cut-off could be altered. All of these engines were throttle governed, which is wasteful in steam. At this time, the Lancashire cotton industry was growing at an alarming rate. Scores of large mill engines were being built in the late 1800s and early 1900s. What was lacking was governing which was proportionate to the load on the engine, and this could not be achieved by the slide valve with its fixed point of cut-off.

George H. Corliss, 1817-1888, was an American in the field of steam engineering. In 1848 he invented his now famous Corliss valve. Here at last was an engine which could govern in proportion to the load on the engine automatically. Furthermore, the cylinder had four steam ports, two steam and two exhaust, with their great economy in steam. I do not know if Mr. Corliss's valve gear was patented in America, but the gear quickly became popular over here. The basic form of the valve has changed little over the years.

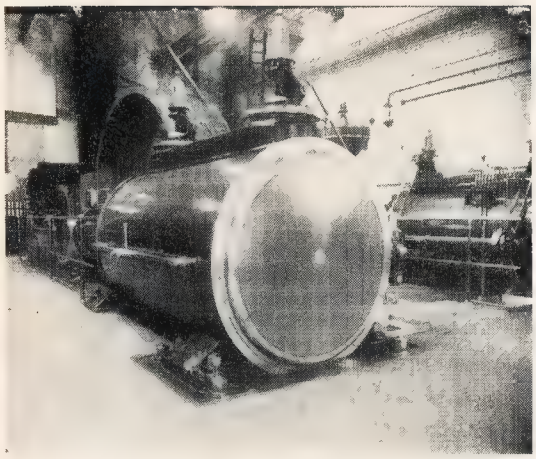
The textile industry is basically composed of two main sections, i.e. spinning and weaving. The raw material was cotton, which had to be imported mainly from America and a smaller percentage from Egypt. The main reason that the industry was situated in Lancashire was that of climate, this was humid and admirably suited to the spinning and weaving of cotton. The area was also served by a fine port — Liverpool. There also existed a system of canals built by Brindley and others, such as the Duke of Bridgewater for the transportation of coal. Finally, there were the Lancashire coalfields, as yet almost untapped. Strangely enough the spinning and weaving were rarely mixed together, that is to say, that a mill was built as either a spinning or a weaving mill;



good economics really, since the two sections were each separately concentrated with their individual engineering technologies. Since the raw cotton had to be spun before it could be woven, this led to the spinning being concentrated in the west of the county, and the weaving in the east. Remember that the raw cotton was imported into Liverpool, the same port also exported the finished cotton all over the world. Later in the 1800s the Manchester Ship Canal was built between Manchester and Liverpool, and Manchester then became the commercial centre for "King Cotton". The reader may well ask "What on earth has all this to do with Corliss engines?" Please bear with me.

First, let me say there is no similarity between spinning and weaving; the two are entirely different processes. A spinning mill, for instance, was not built in the same way as a weaving mill. The basic difference was as follows: Weaving was carried out entirely on the ground floor, so that a large weaving mill covered a very large area in plan. Spinning, on the other hand, was carried out in multi-storeyed buildings, and a large spinning mill would contain up to six or eight floors. The raw cotton was delivered up to the top floor where it was disentangled and cleaned. It was then sent to the next floor down to be "corded", i.e. spun into a thick cord about an inch in diameter. On the bottom floors this tape or cord was successively reduced in diameter until it resembled the familiar cotton thread known to us. This was then wound onto thousands and thousands of spindles (bobbins) and these eventually became the "warp" and "weft" of the weaving mills.

An engine for a spinning mill would be required to drive up to many different floors and this was accomplished as follows: The flywheel was made for cotton driving ropes. The total number of driving ropes was proportional to the total power required by the mill. The same wheel would drive each floor by its own ropes. One of the largest spinning mills in the area, which also had the largest steam engine in the country at the time, was equipped with 75 such ropes! The flywheel was 13 ft. wide and weighed 110 tons. The engine was a horizontal cross compound and the H.P. cylinder was 4 ft. in diameter. The L.P. cylinder was 6 ft. bore by 6 ft. stroke. The engine had drop



Cross compound drop valve mill engine.

valves and was water cooled in the guides and main bearings. It was built by a Messrs. Carels Frères of Belgium and here was one in the eye for Lancashire! As it required more power to spin a ton of cotton than to weave it, an engine for a spinning mill was always larger and more powerful than that for weaving, all things being equal.

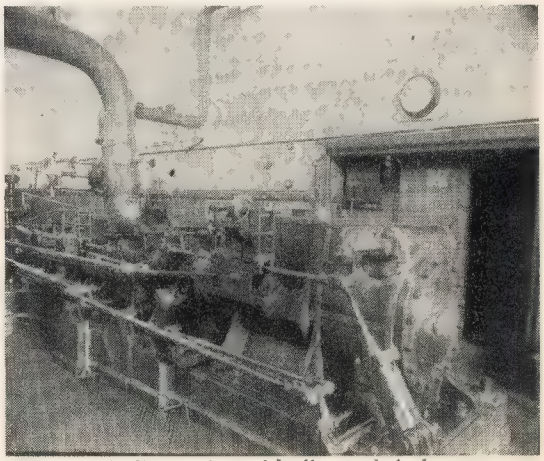
A Corliss engine of medium power such as was required for weaving mills, say up to 1000 i.h.p., remained largely as George Corliss designed it. The cylinder was a complicated casting containing a top steam chest and bottom exhaust chest. In these chests were the valve bores. There were four of these, front and back steam, and front and back exhaust. These valve chambers were at right-angles to the bore of the cylinder. Into these bores were the valves which in action were semi-rotary. These were driven by rectangular section valve spindles, which projected through the front valve covers and were fitted with bell cranks. These levers served two purposes; one to open the valve, the other to close it quickly via a spring-loaded dashpot. Quick closing of the steam valve was one of the main features of the Corliss valve. On the indicator card the point of cut-off is shown as an extremely sharp edge, indeed, the indicator card from a well-designed Corliss engine approaches the theoretically perfect from a thermodynamic point of view.

The steam valves are operated by a device which is known as the "trip gear", which is driven by the steam eccentric. The purpose of this gear is to open the valve to a predetermined point and then release it. It was then quickly closed by the action of the spring-loaded dashpot. The amount of opening of the valve by the trip gear was determined by the position of the governor; an increase in speed resulting in a decrease in steam to the valve, whilst a decrease in speed meant an increase in steam supply to the valve. Thus a constant speed was obtained irrespective of the load on the engine. Constant speed was very necessary to the manufacturing process of the industry, but the load on the engine varied constantly because machines in the mill were frequently being started and stopped.

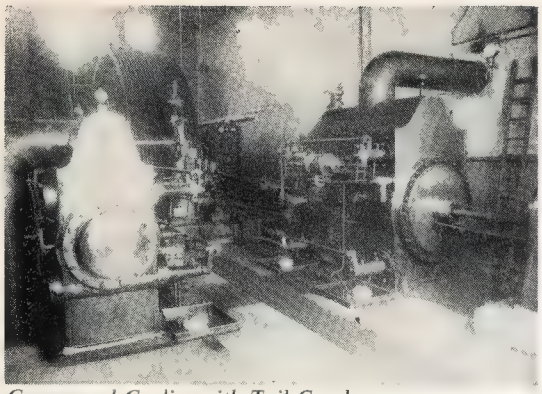
As the industry grew, larger and larger mills were built, and the demand was for engines of larger and larger powers. The Corliss engine as it then was, was fast approaching the limit in size. The boiler pressures in use at the time were in the order of 100-150 p.s.i. and boilers were still regarded as relatively dangerous structures and hand fixed. After all, the cotton manufacturers weren't fixing them.

However, to return to the engines. At this time a further development took place to the engine. This was the introduction of the drop valve. This is a relatively simple type of valve, double beat, and capable of being operated on the Corliss principle, thereby giving all the advantages of the Corliss engine. The valve was nothing like a Corliss valve.

The cylinder of a drop valve was rather less complicated than that of a Corliss cylinder. This was basically a barrel with four circular facings, two on top and two on the bottom; these were front and back steam, and front and back exhaust. On these facings were the "bonnets" which housed the valves. The valves moved up and down in their bonnets, and were spring loaded in order to achieve quick closing of the valves which were driven by valve rods operated by side shafts and eccentrics alongside the engine, and parallel to it. These side shafts were driven from the engine crankshaft through bevel gearing. The steam valve rods were still equipped with the Corliss "trip gear". Many engineers of the time considered the drop valve engine to be an improvement on the



Tandem Corliss engine with diagonal dashpots.



Compound Corliss with Tail Condenser.
(Small photos by courtesy of George Watkins Esq.)

true Corliss engine. Another great innovation later was the introduction of the automatic stoker, which made life a lot easier in the boiler house. However, a cloud was gathering on the horizon.

This was the rapidly developing steam turbine. The turbine, as it then was, was never really regarded as a serious threat to the reciprocating large mill engine. In any case, the cotton industry had by then reached its peak and no more new mills were being built. However, the writer knows of at least one mill in Lancashire which was driven by steam turbine. The local engineers scathingly referred to it as "the windmill" and would have nothing to do with it! Had the cotton industry continued to grow the large mill engine might have had a different story to tell.

LIGHT COMPOUND STEAM TRACTOR — *from page 157*

and slot the bolt holes very slightly. Despite the note on the Ransomes cross section on the hind axle "bracket reversed, date unknown", this drawing shows the spring suspended below the axle boxes, while the detail drawing of the spring mountings and axleboxes etc. shows them *above* the axle, and Gordon Limb tells me that on his engine they are in the former position, pointing downwards. "You pays yer money and takes yer choice", as the old saying goes.

With the assembly of the hind axle bearings and springs, and the drawing of the wheels finished, we are reaching a stage when the engine can sit on its wheels, pending completion of the foretank and tender and sundry other items such as regulator, reversing lever, safety valves, boiler fittings, and of course the awning or canopy. One little fitting which Gordon Limb reminded me to include is the small handle at the rear end of the cylinder block in *M.E.* 3572. This is shown attached to the motion plate, and is to assist in climbing up over the foretank to gain access to the motion and topworks.

The foretank will be the next platework to be dealt with, but before going on to this, I must hark back once more to the compensating gear assembly, to remind readers that I have drawn the compensating gear housing to accommodate the bevel gears and pinions as quoted dimensionally, and it may be necessary, for example, to remove a fraction more material from the pinion apertures, when assembling these trade items in the housing, if gears are not exactly to sizes quoted overall. The sequence of operations when assembling the compensating gear will be: having assembled the axle boxes and centre block bearing as described, and bolted the boxes up firmly to the hornplates, push the hind axle through the bearings, from the offside. Make sure, with the engine weight supported by wood packing underneath the hornplate, that the axle shaft is free to revolve smoothly in its bearings. Fit the single key to the shaft on o/s and press on the drive plate—this needs to be a nice push fit.

On the nearside, fit the two keys on the shaft and press the inside bevel gear into position. Make sure at this point that the axle can turn freely and that projecting bolt heads do not foul either the drive plate or the bevel gear. The axle box bolt heads should be reduced slightly, if necessary, to clear.

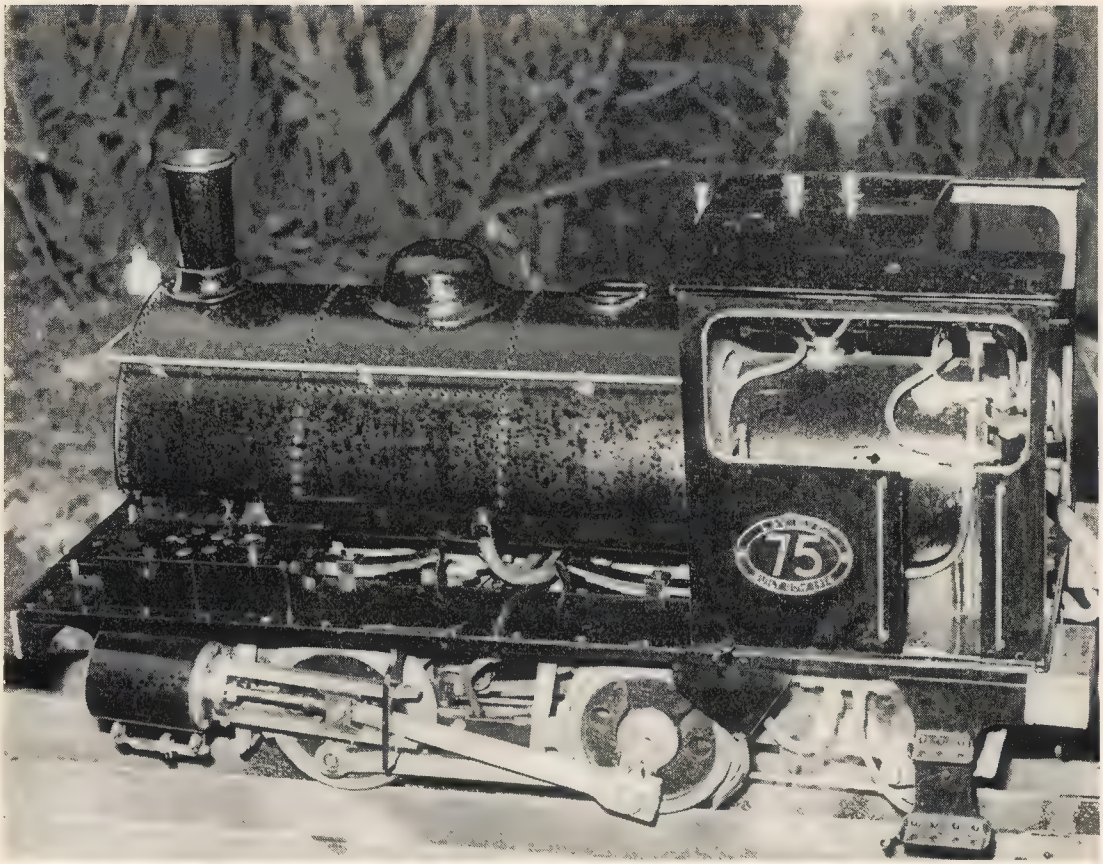
Next, fit the compensating gear housing over the hub of the fixed bevel gear wheel—it should be bored a running fit on the 1 in. dia. hub, and then insert each bevel pinion in turn into the three cast-in apertures in the housing, pushing each bevel shaft into its position through the bevel pinions and into the boss of the housing (or carrier as it is called).

Secure the winding drum in place, registering on the protruding boss of the housing; this keeps the bevel pinion shaft in position, and should be followed by the outer bevel gear wheel which must be a running fit on the axle.

Follow this up with the spacer, which must be machined out on its inner face to follow the contour of the rear hub, and dowelled on its other face to the nearside hub. This is to prevent it turning independently of the hub when the driving pins are withdrawn, making insertion of the pins through to the gear holes impossible. Note that the gear has four pin-holes, the hub and spacer only two.

The compensating gear housing, by the way, must have the large driving gear ring fitted before the drum is attached, but after the bevel pins are inserted. Finally, fit n/s hub and driving pins.

To be continued



SHEFFIELD S.M.E.E. OPEN DAY

Reported by George Wainwright

WELL IF IT wasn't raining it was certainly a cold start to the day. However, at 9.30 there was still a fair amount of work to do in preparation for the influx of visitors expected around 1.30.

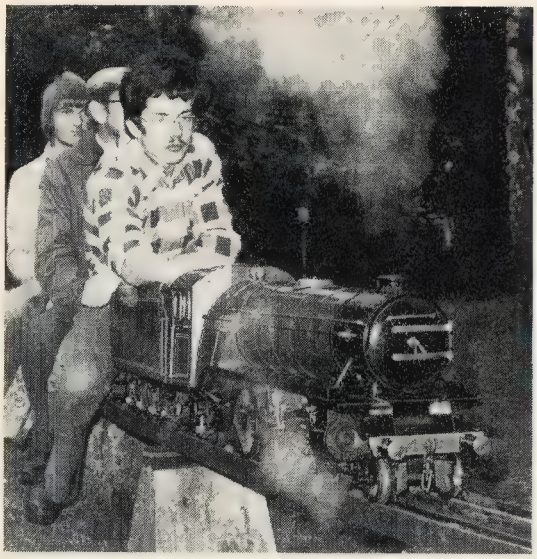
Eric Sayles was already giving the grass a final cut and the site looked quite tidy. Since last year additions to be seen at the open day were the new 100 ft. straight track, an excellent water tower and an experimental colour light signalling system. In spite of the bread shortage the ladies had arranged the refreshments by the time our first visitor was raising steam. Many thanks ladies.

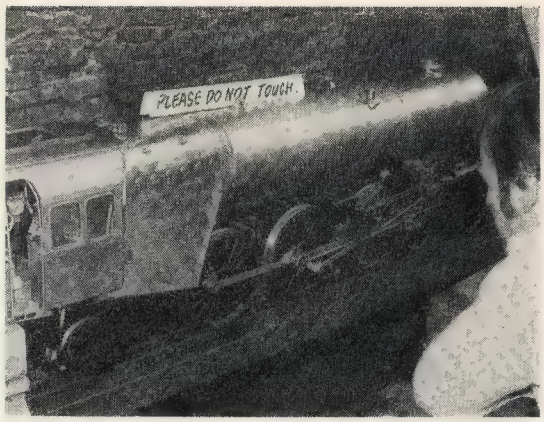
This loco, a very nice $\frac{3}{4}$ in. scale Pacific 3-597 *Gainsborough,* by John Wollescroft from the Buxton Society, ran with various drivers for the whole afternoon.

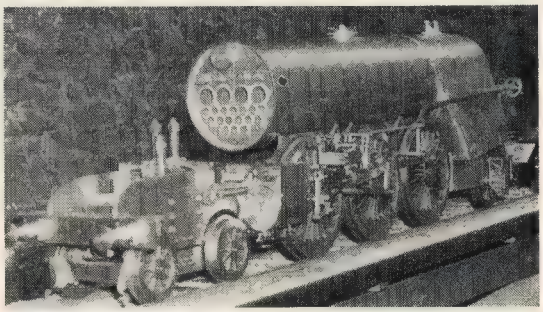
Ivan Law's $7\frac{1}{4}$ in. gauge freelance saddle tank *Vulcan* was soon pounding away with a full passenger complement, Ivan's ten-year-old son Tim taking his turn at the regulator. All traffic was stopped whilst Bill Kirkland's A2 was transported by rail from the car park. Bill is from Nottingham M.R.S. Bill was in steam and running shortly afterwards, giving a total of three trains running at once and with no shortage of passengers.

On static show were some very fine models including stationary engines, and partially-built chassis. John Hatherley's award winning *Speedy* took a late turn on the track, as did George Wainwright's L.&Y. *Pug.* Running continued until dusk with continued help from Ernest Glossop acting as stationmaster for the day.

Heading photo: Signs of hard work being shown by G. D. Wainwright's "Pug".
Top: John Hatherley's 5 in. gauge "Speedy" on the new straight track.
Above: Ivan Law's ten-year-old son, Tim, puts "Vulcan" through her paces in the country.
Left: Roy Kridland looks a little apprehensive as he pulls away on his A2.







Above: Jim Nicholson's son at the controls of Roy Kridland's A2.
Top right: A part-built 5 in. gauge Britannia, also by Roy Kridland.
Bottom right: John Hatherley's part-built ¾ in. scale "Hielan Lassie".

CLUB

First Friday of every month. Lincoln M.E.S. Unitarian Chapel, High Street, Lincoln. 7.30 p.m

FEBRUARY

3 Dublin Soc. of Model and Experimental Engineers. "Problems of a country Workshop", P. McFadden. 8 p.m. in the Star of the Sea school, Sandymount, Dublin 4.

3 Huddersfield Society of M.E. "In the Highfield Clubhouse" Speaker: Mr Sugden. Subject: S. African Railways, slides and film.

4 N.L.S.M.E. dinner and dance. Apollo Suite, Cockfosters.

4 The Society of M. & E.E. Talk. Model Yacht Design. Construction Trends 1965/1977.

4 M.E.S. of N. Ireland. Monthly meeting. Strathern Hotel, Holywood, Co. Down. 3 p.m.

5 Basingstoke & District M.E.S. Track construction.

6 City of Leeds S.M.E.E. An evening with Mr Bellamy.

6 Worthing & District S.M.E. Auction Sale. Broadwater Paris Room 7.30 p.m.

6 Clyde Shiplovers & M.M. Society, film night.

7 Taunton M.E.S. Film evening. 7.30 p.m. Taunton Rugby Club Committee Room.

7 Guildford M.E.S. ex. Com. Meeting.

7 Milton Keynes Model Soc. Talk on astronomy by M.Kingston. 8 p.m. Royal Engineer, Statford Road, Wolverton, Milton Keynes.

7 N.W. Leicestershire M.E.S. "Model Hot Air Engines" Prof. Chaddock at N.L. Miners Welfare Centre, Coalville at 7.30 p.m.

7 Sutton Coldfield & North Birmingham M.E.S. Models and Prototypes.

8 Norwich & District S.M.E. Informal evening bits and pieces. 7.30 p.m. The Assembly House, Theatre Street, Norwich.

8 Sutton Coldfield Railway Society. Trains in Action—part 2. Max. lock cine.

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

8 Bradford M.E.S. Committee. 7.30 p.m. Eccleshill Com. Centre.

8 Southampton & District S.M.E. Photographic comp. 8 p.m. Alan Bealing, Malvern Hotel

8 The Vale Model Eng. & Risborough District M.R.C. "Railex '78", Model Eng. and Model Railway Exhibition. The Civic Centre Aylesbury Bucks. Society and Trade Stands, 10 a.m. to 6.30 p.m. Adults 35p. Jnr/Snr Citizens 15p.

8 Bristol S.M.E.E. 7.30 p.m. British Rail staff Assen. club, Temple Meads station, Bristol. Films of miniature railways by Roddy Davinport.

9 Hull S.M.E. Discussion.

9 Sutton M.E. Club. "Dukedog" Bill Carter of the S.M.E.E. talks on his latest model of a Gt. West. loco.

10 Brighton & Hove Soc. Boiler Making by Alec Farmer, Barnham Hotel, 7 p.m.

10 Chichester & District S.M.E. Illustrated talk by Alec Farmer on Boilermaking. 7 p.m. Barnham Hotel (opp. Barnham Railway Stn.) Barnham. All friends welcome.

10 The Isle of Man Steam Rail Supporters Assen. N.I. group. A.G.M

10 The Thames Shiplovers & Ship Model Society. Radio Controlled sailing led by Alastair Brown. St. Botolphs Church Hall, Bishopsgate, EC2.

10 Kinver & West Midland S.M.E. Bring and Buy night and members new films. 7.30 p.m.

11 The Society of M. & E.E. Disposal Sale.

11 Hull S.M.E. Exhibition of models at the City Hall by the Hull S.M.E. for the Kingston Lions.

12 Basingstoke & District M.E.S. Track construction.

13 Wirral M.E.S. Annual General Meeting. Victory Hall, Upton. 7.30 p.m.

DIARY

13 The Erewash Valley M.E.S. Meeting at 24 Park Drive, Sandiacre, Notts and talk by Alf Nash. 7.30 p.m.

13 Bedford M.E.S. A.G.M.

14 Basingstoke & District M.E.S. Club night—informal.

14 Romney Marsh M.E.S. Members films and slides, Church Hall, New Romney 7.30 p.m.

15 Guildford M.E.S. Bits and Pieces comp. 7.45 p.m. at HQ Stoke Park.

15 Sutton Coldfield R.S. Members slide and photo comp.

15 Birmingham S.M.E. at Sheepcote Street. Jim Clements—A Miscellany from 12" to 10 mm per foot.

15 Bradford M.E.S. Social.

15 Cannock Chase M.E.S. Meeting Lea Hall Club 7.30 p.m. Life on the Canals—Mr Childs.

15 Derby Soc. of Model and Exp Eng. Bits and pieces.

15 Rugby M.E.S. A 7¼" Gauge loco "Andes". by J. Strickland.

16 Milton Keynes M.S. 7.15. The Library, Harpur Street, Bedford. Talk on "Thirty years with the Romney, Hythe and Dymchurch Railway" by Mr G. Barlow.

16 S.M.E.E. Technical film night.

16 Leyland, Preston & District S.M.E. Meeting at Roebuck Hotel, Leyland. 8 p.m.

16 Warrington & District M.E.S. Model gun/hot air engine talk by Bill Savage in Pavilion, Daresbury at 8 p.m.

17 Dublin Soc. of Model & Exp. Eng. "Petrol engine Topics", J.F. Hickie. 8 p.m. in the Star of the Sea School, Sandymount, Dublin 4

17 Stockport & District S.M.E. Talk—speaker to be announced. The Parish Hall, Church Street, Cheadle, Cheshire. 8 p.m.

Club Chat... with the Editor

The Sussex Miniature Locomotive Society has, like many other clubs, been hard at it over the winter improving the track and its surrounds. A few of the unwanted inclines have disappeared and old piers and slabs have been replaced with new. The work has also extended to the club-house with new carpet tiles and interior decorating. I, for one, will be going to have a look some time this year. On a note of sadness the club has reported the death of Wilf Coxwell who was the stationmaster at Beech Hurst for several years not so long ago.

As I remarked in an earlier edition of "Club Chat", it sounded as though the club stand of **North London S.M.E.** would be well worth a visit. It was. Although the club had experienced a little lighting difficulties to start with, the display of models was well appreciated by the crowd. Being located at the end of the track, those people waiting for a ride could not help but notice the club stands and every one was a credit to our hobby. Hopefully they will also have stimulated an interest in new members. The other clubs in the Hampton Room were **Malden & District, Harrow & Wembley, Welling & District, Chingford & District,** and the **Southern Federation of M.E.S.** To complete the line-up the **Kew Bridge Engine Trust** and the **Association of Railway Preservation Societies** were present. Well done.

At the **Reading Society of Model Engineers,** Chairman Tony Wood decided not to seek re-election at the A.G.M. and that position has now been filled by Derek Wilkinson. Following the successful February shows in the Old Town Hall over the past four years, this club is aiming high with a two-day event planned for this year at The Hexagon in the new Civic Centre. The dates are 1 and 2 April and other Societies are welcome by prior arrangement. Entry forms may be obtained from the Exhibition Manager, Alasdair Milne, 39 Springhill Road, Goring, Reading, Berks.

Milton Keynes M.S. now has attractive lapel badges designed by Chris Bellchambers for sale at 80p each. Any member of that club who didn't know about them until now can obtain them from the secretary, Chris Orchard.

Malden & District S.M.E., mentioned above, has now written to tell us about the work in progress on the track—re-laying of the ground level track through the station "Willowbank", new points and track to the carriage sheds, additional signalling, and general improvement to the raised track. The test track is having its share of attention, which will please the 2½ in. gauge chaps, and we have been promised an article with photos later. The A.G.M. saw the election of new officers. The secretary is Mr. J. E. Cook, 27 Vallis Way. Hook, Chessington, Surrey KT9 1PX. Telephone is 01-397 3932.

It looks as though they have been having fun at the **Bristol S.M.E.E.** with a ladies' night in which members of the society displayed talents hitherto unrecognised. On 14 August the club helds its A.G.M. which means that a new secretary is in office. He is Mr. D. J. Lewis of 45 Westbourne Road, Downend, Bristol—telephone 0272 560448. Visitors to Ashton Court are welcome but please contact the track manager first—he is Mr. F. A. Howard, 35 Highfields Road, Portishead, Bristol. Telephone is 0272 844619. The annual presentation of awards here had a special item of interest in that one prize went to the builder of a Stuart Turner stationary engine—a young lady by the name of Isobel Griffiths. Well done Isobel. The first 100 ft. of 7¼ in. track has been laid at Ashton Court and received due attention on Boxing Day from some 50 members, all no doubt seeking an airing after the Christmas Day festivities.

Here's a comparatively new one, **The Canvey Railway Club** which was born in April of last year. By the report in hand it looks as though the locals there have been waiting for just this club and membership is soaring. At present only a portable 5 in. gauge track is available but a 3½/5 in. track is being built. Hopefully this will start soon and will grow to about 1500 feet eventually. You can learn more about this club, which, by the way, is situated on the Thames Estuary near Southend, by contacting the club secretary, Mrs. C. A. Raiman, at 70 Church Parade, Canvey Island, Essex.

Over 400 people attended the Super Open Day at "Dee" Mill, Shaw, on 3 December for the **Northern Mill Engine Society** event. The club funds swelled by over £200. On *Wasp* the society have assembled the flywheel to the shaft and the cylinders are now in place with valves. On *Diamond,* the vandalised engine house has been repaired and is watertight. When the weather improves the outside will be painted and *Diamond* will be ready to steam.

Mr. A. Prossner, secretary of **Westland M.E.S.,** has changed his address. It is now 14 Nash Lane, Yeovil, Somerset BA20 2HN.

Unhappy news from **Eltham & District Locomotive Society** where the death of Mr. F. H. Bradford was reported on 3 December. Mr. Bradford worked at the L.&S.W. Railway up until 1916 when he joined the police force and then the machine gun corps. He exhibited a steam tug at the M.E. Exhibition of 1920, at which time he was a member of Kent M.E.S. In 1945 he started working for the Air Ministry and in the same year founded the Eltham & District Locomotive Society where he held on separate occasions the positions of chairman, secretary, club auctioneer, and president. He built two locos in partnership with son Ken, a 4-4-0 Drummond and a 2-6-2 freelance. Both were ¾ in. scale.

The Southern Federation of M.E.S. has been busy arranging meetings for this year and the emphasis is on the fact that the Federation's aim is to encourage all aspects of model engineering. The Spring Rally will be held at Peterborough where there is a large area for traction engines and the second Rally will be at Maidstone where—to anyone familiar with Mote Park—it will be appreciated that facilities are available for a wide variety of models.

The West Riding Small Locomotive Society is seriously discussing the possibility of running its own form of loco trials with or without the use of a dynamometer car. It has been suggested that the club already owned one but so far the search has revealed nought. If the trials do take place then contestants will be very relieved to hear that steps have been taken to shield the track on the upgrade into the cutting

Continued on page 178

Post Bag

The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

Retracting Tools for Screwcutting

SIR,—I was interested in George Thomas's article on retracting tools for screwcutting, especially as he made reference to my remarks in my article of 6 May, wherein I expressed my opinion on these out of the ordinary fitments, which is backed up by the fact of so few lathes being fitted with them. When I remarked that they would be of no earthly use for internal work, I had in mind trying to use a retractor capable of clearing say 6 t.p.i. in a bore of say 5/16; I notice Mr. Thomas mentions this in his article, and added a plate and adjustable stop to cope with the difficulty; also he mentions that the tool has to be positioned almost as accurately for withdrawal as for cutting—O.K. for a big run, but what a time wasting, fiddling job on "one offs", say a sackful of gunmetal fixed bushes for slide-rests, all different sizes and threads.

Now as to Mr. Thomas's brainwave of turning the tool upside down, this was regular practice by many turners, including myself, working on war-worn lathes towards the end of the First World War; besides, on big jobs it was easier to see what the tool was doing.

Having reference to Mr. Thomas's remarks about chasing threads, "I would never dream of applying a chaser to a screw-cut thread", how would he finish off the tops of the threads if he was on piecework? A chaser properly used is a form tool and used universally as such.

Mr. Thomas remarks that I am no doubt thinking in terms of the screws I have cut in the past: I often do quite proudly, Square thread, Acme, Buttress, Sellers, and Metric; from 2 t.p.i. to 40 t.p.i., the latter being for micrometer repairs, internal and external, so I have quite a lot to think about.

Newcastle-upon-Tyne. E. H. Jeynes

The article in question started off as a letter to "Post Bag" in answer to Mr. Jeynes's comments on retracting slides but it became too long and so was made into a short article. It would appear that Mr. Jeynes feels that his view that retracting devices are, comparatively speaking, useless is backed up by the fact that one sees very few of them. The fact is that only lathes of the higher quality class are so fitted and, being much more expensive than the common run of machines, are more rarely seen. The Hardinge HLV-H, possibly the finest small (5½ in. x 18 in.) precision lathe available today, is capable of screw-cutting at normal turning speeds and, in order to save time, it has a retracting mechanism built into its top-slide. In appearance, this is very similar to mine (p. 1100) which is quite coincidental because I had never seen a Hardinge nor an illustration before I made my own.

The difficulty with internal screw-cutting arises only when the bore is small compared with the size of the tool, as in the example I gave. The positive withdrawal stop effectively overcame this difficulty. When the tool is almost as large as the bore, the accuracy of positioning remains, whether a retracting device is used or not. *It is much easier to pull out to a positive stop than to wind out the tool to a given setting on the dial after every cut. The size of run makes no difference at all.*

I, in common with most other readers of "M.E.", am not on piece-work. Today, the items that Mr. Jeynes has in mind would be turned out on a capstan or turret lathe and have perfect threads cut by a Coventry or Tangential type die-head in a second or so. Non-standard threads were, in my shops, screw-cut on Herbert turret lathes using a tangential form of machine-chaser and, incidentally, the chaser was withdrawn automatically as the nut was disengaged from the leader at the end of the cut.

I have nothing but admiration for the craftsmen of the past who turned out excellent work on machines which would now be useless because they could never possibly meet the exacting requirements of much of the work done today. I have before me some specimens of work in S80 stainless steel, the limits and finish on which (.0002 in. and 16 micro-inch) call for the use of machines of a quality that was never dreamt of 50 years ago. G.H.T.

Removing Clogging From Fine Cut Files

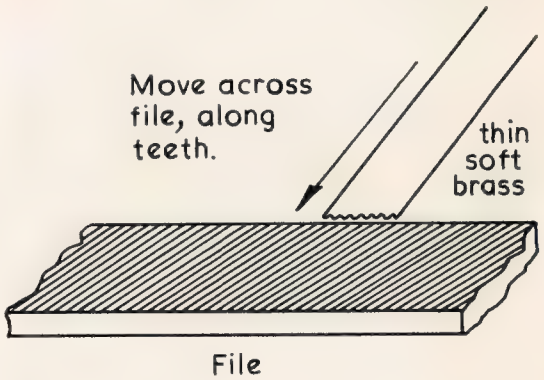
SIR,—I was interested to read Mr. Thwaite's letter (Vol. 143, No. 3571).

A sure and speedy way of removing clogging or pinning from fine cut files is to pass a piece of thin soft brass sheet, ¼-1 in. wide, along the teeth, across the width of the file.

After one or two passes, using some pressure, the brass takes on the tooth form of the file being treated and clears all foreign matter with ease.

After treatment, snip off the teeth formed on the de-pinner and it is then ready for the next file.

Wrexham, Clwyd LL12 8RL. P. O. V. Champion



Cleaning Files

SIR,—The letter from I. T. Thwaites on the subject of cleaning files interested me greatly.

He refers to the state of the files as being clogged and the remedy he suggested was the use of a scriber or suede brush. May I point out with respect, the process of depinning or declogging a file with a scriber is strictly bad practice as great damage is done to both the scriber and the file.

I have always found that the best method of cleaning a file is to rub the file at the angle of the cut of the file with a wedge of wood or a soft piece of copper. The latter being the more efficient as after the initial passes over the file with the copper strip the pattern of the belt becomes imprinted in the copper and provides an efficient cleaning tool which minimises the damage done to the file.

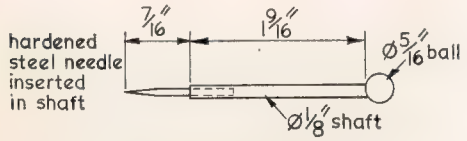
Hull, Yorkshire HU5 4NN. Kevin J. Shanks

Setting-up Aids

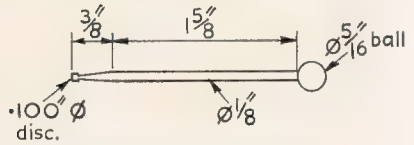
SIR,—George Thomas's article on "Setting-up Aids" (Vol. 143, No. 3566) prompts me to write enclosing the drawings of a wiggler purchased in Cape Town around 1965.

The tool is manufactured by General Hardware Mfg. Co. Inc., New York, NY 10013. It comes in a small plastic wallet entitled "Wiggler or Center Finder Set", 4 piece 5-389-4, and presumably will be known to our American friends.

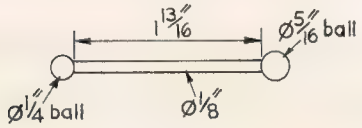
The tool was purchased during a browsing session in a tool shop and strangely enough has never been used as I was never quite certain how it should be used! G.T.'s article therefore has come as a pleasant surprise and the little set can now be put to use. Perhaps G.T. can cast some light on the .250 in. ball



① NEEDLE POINT SHAFT



② DISC CONTACT ·100"



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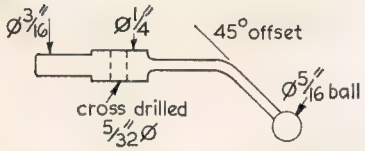
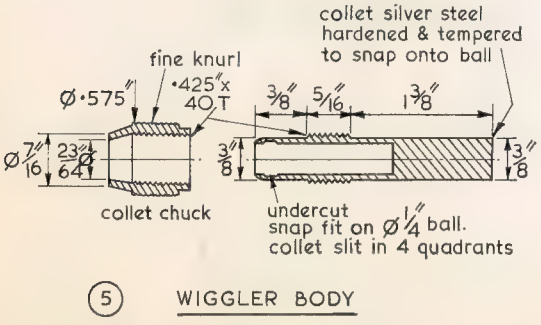


④ OFFSET INDICATOR HOLDER



⑤ WIGGLER BODY

contact? Having seen George Thomas's lathe tools at work, might we not persuade him to produce an article on his tips for sharpening (including his D-bits which I believe he sharpens somewhat differently from normal). I would dearly like to see him produce a lathe tool sharpening jig which I believe he has already designed—regrettably the Quorn I feel a little too advanced for myself and there must be others in a similar situation. I thoroughly enjoy your articles on toolmaking that appear from time to time—my next project will in fact be the fine staking and tapping tool by Mr. Thomas.

Trusting this letter may be of interest to Mr. Thomas and other readers.

Johannesburg, South Africa. C. D. Harrington

By coincidence George Thomas was sent a set of "wigglers" which he mentions in the letter below. He has also received many comments on other matters which not only inspired this response but has led to the article "Matters Arising". This will be published shortly.

George Thomas Writes

SIR,—I would like to thank those readers who have contributed to "Post Bag" and also the many who have sent letters to me personally on the subject of edge-finders from which I learn that they are, in fact, being made commercially by a number of firms. The first one I ever saw was a commercially produced article and it was possibly at a machine-tool exhibition that I saw it, but this was many years ago and I cannot remember having seen one since. My article has produced a whole crop of them! Since writing the article I have been able to carry out tests on one made in the U.S.A. (called a "wiggler"). It gave a disappointing performance. This led me to carry out further investigations into their behaviour which are fully described in an omnibus article, under the heading "Matters Arising" which, as soon as some necessary photographs are ready, will be submitted to our Editor. Incidentally, there was a description of an edge-finder in *M.E.* Vol. 128 (1963).

Apart from the edge-finder made by Offen & Co. Ltd. which Mr. L. F. White mentions in his interesting letter (7/10/77) he describes a method of in-feeding for screw-cutting which he finds is generally unknown. I have in preparation an extensive series of articles on Screws and Screw-cutting in which the method which Mr. White mentions is already covered in my notes, but I have remarked that it is based on the Whitworth-form thread because tan 27.5° = .521 and so, if the topslide is fed along by one half of the infeed, then there will be a *very* small amount shaved off the trailing flank, only .0016 in. for an 8 t.p.i. thread.

Personally, I prefer the angular in-feed method and find no trouble in arriving at the correct amount of feed, for which tables are not really necessary; it is one and one-eighth times the nominal depth of thread. Thus, mentally, the depth of 16 t.p.i. = 640/16 = 40 which, times 1.125 = 45 (thous). In order to provide a small shaving action I usually set the top-slide to 25° instead of 27½° and alter the feed in to 1.10 times the depth, which is even easier! Some turners use a system of feeding down the angular flank which involves no calculations at all, and it all comes out right in the end. Finally, I wonder if the date 1914 in Mr. White's recollections is a misprint because I would make out his age to have been five years then.

New Milton. Geo. H. Thomas

Walschaert's Valve Gear

SIR,—In a recent edition of *M.E.* Martin Evans, writing about the design of this gear, mentioned the difficulty of establishing the back-set of the tail-pin in order to obtain equal swings of the expansion link about its vertical centre-line and made a plan that someone with more mathematical knowledge than he would perhaps care to establish a mathematical solution to the problem.

Two different solutions have now been put forward. One by Dr. F. M. Burrows, the other by Mr. A. Gettings. Both gentlemen deserve our thanks.

Now, Mr. D. Ashton has introduced unequal swings of the link to the discussion. This is a design feature, not previously mentioned, which imposes completely new conditions and which deserves to be thoroughly discussed in the pages of *M.E.*

Mr. Ashton's reference to the excellent results obtained in full size must surely indicate that the full-size railway engineer did not establish the back-set of their expansion links nor the lengths of their eccentric rods with dividers (trammels?), and that they must have had mathematical solutions to their problems.

How sad that those who know the answers to these problems and read *M.E.* do not divulge the information which must now be virtually irrelevant to full-size railway practice in the diesel and electric era, but would be of great value to miniature locomotive constructors like myself who attempt to design their own Walschaert's valve gear from first principles only to find that one of these first principles, i.e. equal swings, has now changed.

Hailsham, Sussex. A. Thorp

Winding Jig for Unimat

SIR,—I read with interest Mr. Collins' letter ("Post Bag, *M.E.* 3571). Unfortunately he gives no details of the switching arrangement which he has adopted. If, however, he has adopted a mechanical arrangement similar to that of Mr. Tingey, this could explain his difficulty since above 10 Hz (600 r.p.m.) mechanical switches are prone to contact bounce. A more satisfactory result might be achieved by using a new switch which could be operated by a small magnet attached to the periphery of an aluminium disc mounted on the output shaft of the engine. The ultimate solution to the problem would, no doubt, be some form of electronic or opto-electronic arrangement which could, no doubt, be devised by one of your more electronically qualified readers.

Kincardine, Fyfe. B. T. Curle

Meccano

SIR,—I must comment on A. V. Smith's (Sheffield) letter on page 1258 of *M.E.* No. 3572 (4-17 November 1977).

I support Martin Cleeve in his statements about numbering of sets (Meccano). I had a No. 0 Meccano set in 1916 for Christmas—still have the parts. In the construction book the sets were numbered 00 to 7.

In a manual—long before 1936—or 1937 as Mr. Smith has it, I read Meccano Outfit No. 00—3s. 6d., and so on up to No. 7 at 37s. (I still have it).

Come Mr. Smith, more research needed.

Ashford, Kent. W. Tomsett

So many letters re Meccano have been received that a page will be devoted to this subject soon.—Ed.

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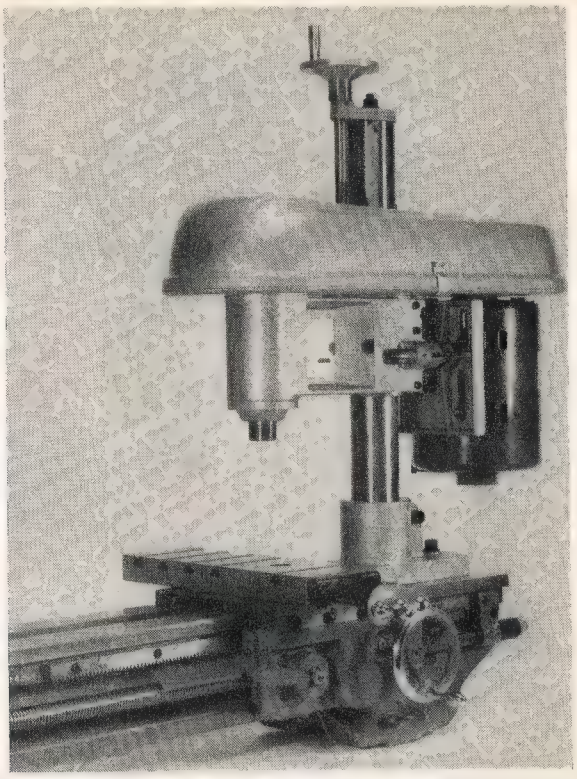

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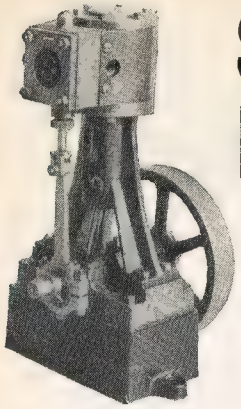

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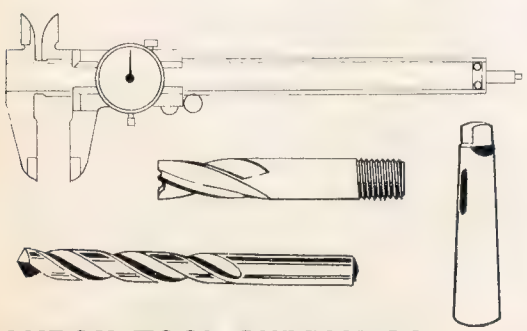

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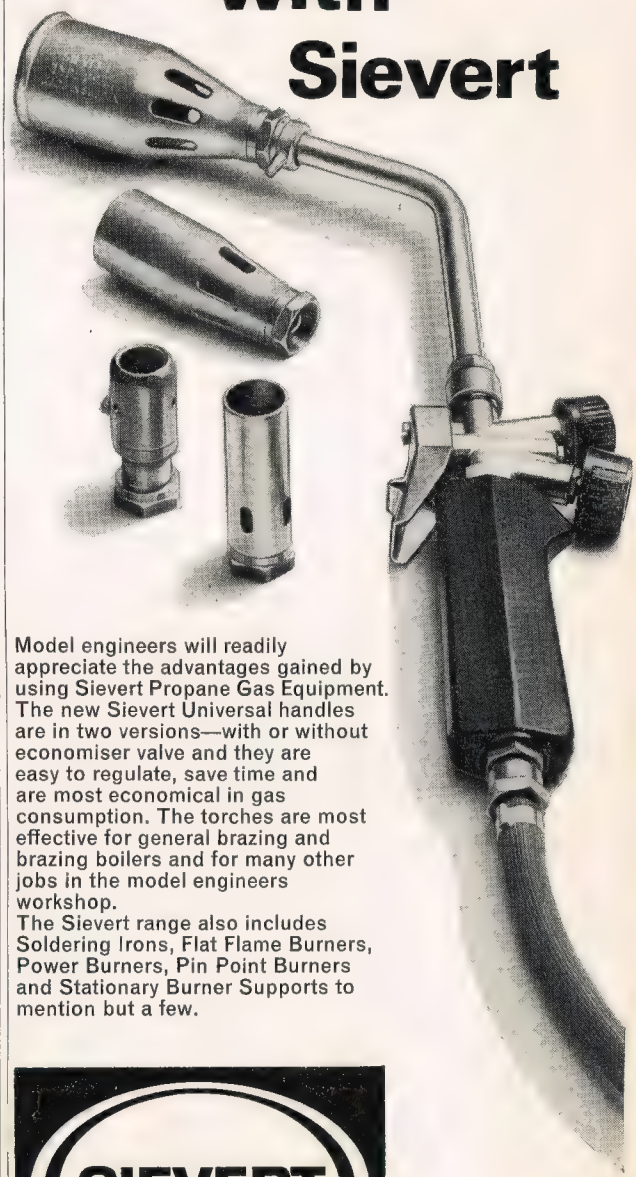

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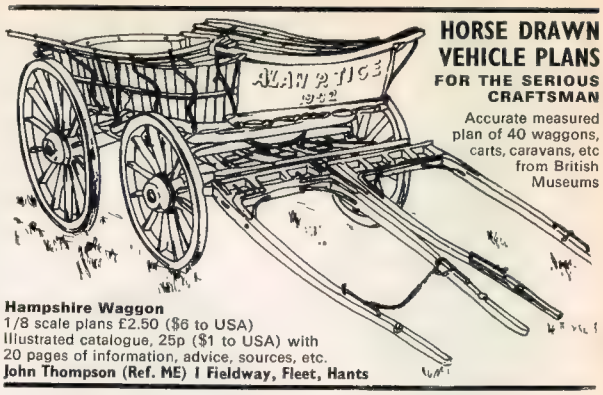

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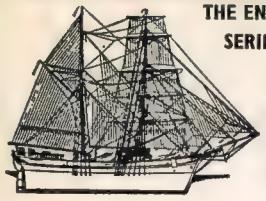

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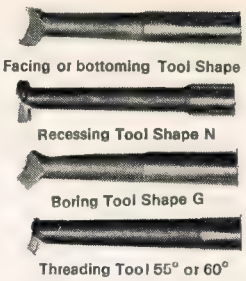

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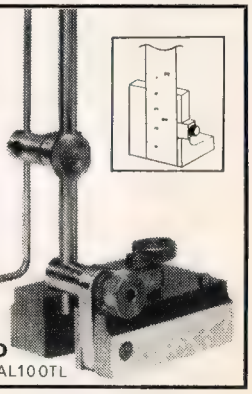

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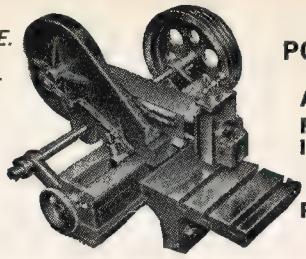

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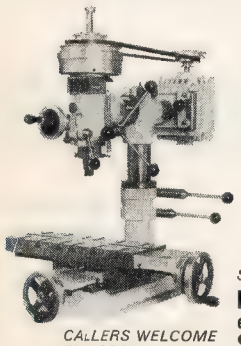

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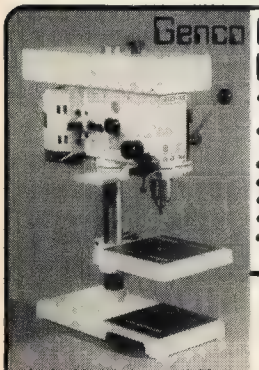

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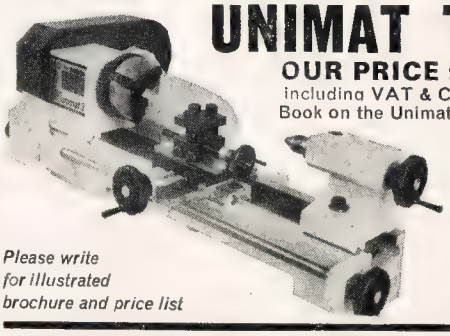

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CLUB NEWS—*from page 165*

from the effects of wind. Ron Drake tells us that a line of trees has been planted, presumably on the side of the prevailing wind, by Tony (Roberts?). They are nine inches high, so at present are restricting their protective characteristics against those low-level winds, but give them time.

Brighton & Hove Society of Miniature Locomotive Engineers has informed us that a Supporters Organisation has been formed for the Brighton Museum of Transport. The railway section has two *Brighton Belle* coaches on display and the National Railway Museum has presented on loan the S.R. 2-BIL electric multiple unit in working order. These and others were to be seen at the Open Day. The Friends of Brighton Museum of Transport has now been formed to hold monthly meetings at which interesting talks will be given on subjects relevant to transport. No doubt many of the Brighton club will be joining but if anyone else is interested why not contact the Hon. Sec. of the society? He is Mr. G. F. Collins of 10 Marden Close, N. Woodingdean, Brighton BN2 6NJ. Telephone is Brighton 37692.

Here is a surprise. At the Norwich City College the classes for model engineers have been discontinued due to lack of support. **Norwich & District S.M.E.** informs us that they may yet be reintroduced after Easter if more people enrol. It is understandable that the more experienced model engineer with a well-equipped workshop may avoid such classes if he feels that he has nothing to gain from attending. But this cannot apply to the younger and less knowledgeable chaps. Regretfully this failure to encourage newcomers to the art has been reported from many corners of the U.K. and the clubs are in no way to blame. At Norwich, for example, the arrangements for the Wensum Lodge Exhibition on 6, 7, 8 April are going ahead with full support from other model clubs in the area. If local and national exhibitions fail to encourage new people, what can?

Down at **The Castledare Miniature Railways** in W.A. they are having the same need to increase subscriptions as in the U.K. They are also introducing a scheme whereby if a Full Metropolitan Member attends one work day, one running day, and one meeting per month he receives a rebate of $1.50 on his annual membership fee. On the other hand if he fails to attend at least six times per year without just cause his membership will be terminated. Judging by the number of members turning up for track laying and what have you there seems little likelihood of a drastically reduced membership.

From the same part of the world—the **Western Australian S.M.E.** to be exact—comes this photo of activity at the track at Claremont, Perth. The track is for 5, 3½ and 2½ in. gauges and is of welded steel throughout. Rainwater is laid on for the locos but we are not told how often this occurs—judging by the photo, not often. I will no doubt be put wise on this. Apparently the water supplied by the authorities is not ideal for boilers. On the occasion shown three locos were in steam, a 5 in. gauge Simplex, a 3½ in. three-cylinder Pacific, and a 1 in. scale, 3½ in. Pacific. Builders are, respectively, E. Webb, G. Maddern. and the late R. A. Fardon. This club meets at the Claremont Wesley United Church Hall and the secretary is Mr. J. G. Ockleshaw of 73 Harborne Street, Wembley 6014, Western Australia. The president, who sent us the information, is Mr. R. S. Minchin who tells us that occasionally they receive visits from overseas, Mr. Andy Brandam of the Wirral Society being one of the most recent.

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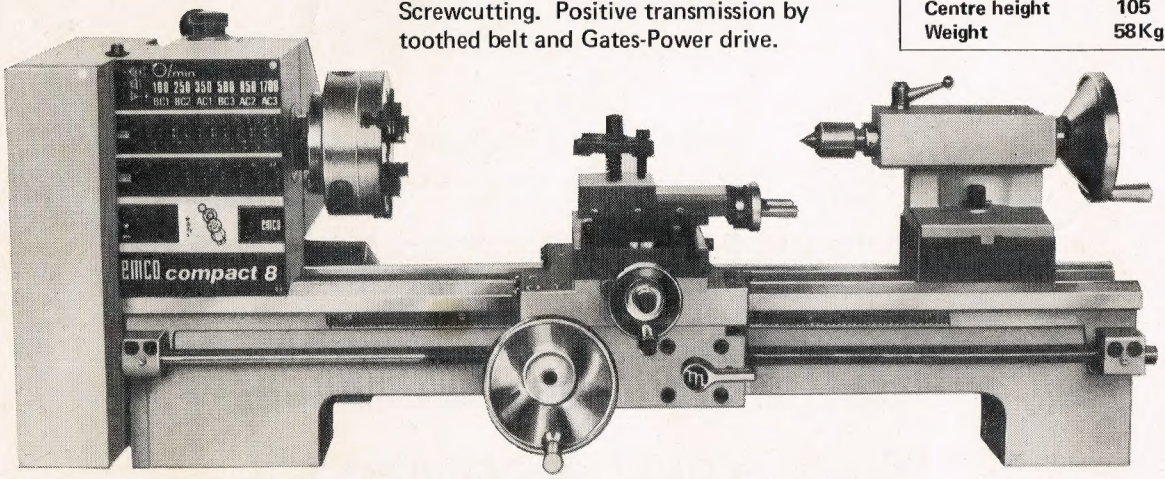

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